Johnson Space Center
Procedural
Requirements

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Verify that this is the correct version before use

Compliance is Mandatory

JSC SAFETY AND HEALTH HANDBOOK

Responsible Office: Safety and Mission Assurance Office

Change Record for JPR 1700.1, "JSC for Safety and Health Handbook"
(Baseline – Revision G)

Change . .	*Date . . .*	*Originator…*	*Chapters affected . . .*	*Description of change . . .*
Change 1 to Rev G	11/14/97	D. L. Clem, extension 34272	106 203 505	Adds process for reporting international mishaps Removes requirement for bicycle helmets Updates lifting requirements
Editorial	7/10/98	D. L. Clem, extension 34272	Preface	Revises JSC Safety Policy per ESC direction
Change 2 to Rev G	8/6/98	D. L. Clem, extension 34272	114	Updates safety committee structure Changes time to serve on committees and allows for volunteer members
Revision H	2/3/99	D. L. Clem, extension 34272	Entire Document	Includes upgrades from comparing JPG 1700.1 with NASA requirements Includes upgrades from comparing JPG 1700.1 with 29 CFR 1960 requirements Includes upgrades from comparing JPG 1700.1 with VPP and PEP requirements Includes other changes suggested by various JSC organizations
Change 1 to Rev H (Editorial Included in hard copies)	3/99	D. L. Clem, extension 34272	100 101 108 309	Update URL to on- line version and paragraph 5 Include JSC Safety Policy and rearrange chapter Update cross references Clarify "enough time" to "3 - 5 days before TRR"
Editorial	7/2000	D. L. Clem, extension 34272	Subject Index	Changed "Job Safety Analysis" to "Job Hazard Analysis" to be consistent with Chapter 111.
Revision I	7/2002	D. L. Clem, extension 34272	Entire document	Reorganizes program requirements around VPP elements. New Lockout/Tagout and Chemical alarm chapters. Updates to other chapters.

Verify this is the correct version before you use it by checking the on-line version.

Change 1 to Rev I	11/7/02	D. L. Clem, extension 34272	3.6 5.1 5.2 6.8 7.3 Glossary 2.7, 6.8, 6.10, 8.1, 9.3, and Attachment 3.6A – Appendix 3B	Changes to medical exam requirements. Clarifies storage requirements. Clarifies requirements for space heaters New safe work practices and design requirements. Added responsibility for radiation equipment. Changed Oxygen Enriched Atmosphere definition. Clarifies emergency number for the Sonny Carter Training Facility.
Change 2 to Rev I	5/11/04	D. L. Clem, extension 34272	5.7 Part 12	Changes to accommodate new Part 12 Adds new Asbestos Control Requirements. This is a revision of the Asbestos Control Manual
Change 3 to Rev I	6/2/05	D. L. Clem, extension 34272	Document number 5.9 6.1 6.5 6.8 6.13 8.5 & Appendix 5B 8.6 8.7 9.1 9.2 10.1 12.1 and Part 12	Changed number to JPR 1700.1 New chapter on Weather Safety Updates emergency eyewash & shower reqmts Updates emergency eyewash & shower reqmts Updates emergency eyewash & shower reqmts New chapter on breathing gases Adds inspection program for forklifts & slings, eliminates duplicate requirements Adds inspection program for power tools Adds inspection program for ladders Updates several hazardous material requirements Updates several hazardous material requirements Updates emergency eyewash & shower reqmts Clarifies applicability to JSC field sites Removes advisory language and updates organizational titles & document numbers in several other chapters

Change 4 to Rev I	9/25/06	D. L. Clem, extension 34272	2.4	Adds reference to NASA Facility System Safety Guidebook.
			2.7	Updates mishap investigation products to reference NASA mishap reporting and investigation requirements.
			5.2	Adds requirement not to wear jewelry during maintenance or troubleshooting on any electrical or mechanical system.
			6.1	Revises processes for handling and disposing of batteries.
			6.4	Revises food safety requirements.
			6.11	Adds a requirement to test oxygen and oxygen enriched gas systems with oxygen or oxygen-enriched gas before introducing a human into the loop.
			6.13	Adds requirement to allow the Safety and Test Operations Division to waive cleanliness requirements.
			10.1	Adds construction safety requirements as a result of a mishap investigation and updates requirements for construction barriers.
			10.3	Adds provisions for a less-rigorous Use Readiness Review.
			11.2	Adds requirements for construction contracts as a result of a mishap investigation.
			Glossary	Updates the definition of "oxygen enriched" consistent with the changes to Chapter 6.11.
			Several	Updates title of the Occupational Health Branch
Change 5 to Rev I	1/12/07	D. L. Clem, extension 34272	8.2 Appendix 8B	Temporary change via JSC Announcement to update Lockout/Tagout requirements pending a complete revision of JPR 1700.1. Also deletes Attachment 8.2A and revises Attachment 8.2B of Appendix 8B.
Revision J	4/16/08	D. L. Clem, extension 34272	Entire Document	Complete revision to several chapters.

Change 1 to Rev J	06/10	D. L. Clem, extension 34272	Chapter 5.6	Update process for getting prescription safety glasses.
			Chapter 6.2	Updates to laser safety consistent with higher level requirements.
			Chapter 6.6	Make physical exam requirements consistent with chapter 3.6.
			Chapter 6.11	Update to gas cylinder requirements.

Change 2 to Rev J	6/9//11	D. L. Clem, extension 34272	Chapter 1.4	Change process for waivers and changing the handbook to be consistent with revised higher-level requirements.
			Chapter 2.4	Revised list of required hazard analyses. Added clarification on verification methods. Clarified JHA content. Added list of approvals for hazard analyses. Clarified RAC criteria.
			Chapter 2.5	Added reference to NPR 8705.6 for Headquarters audits.
			Chapter 2.7	Added requirement to notify Headquarters of injury reports to OSHA, per NPR 8621.1 Made mishap levels consistent w/NPR 8621.1.
			Attachment 2.7D	Mishap levels consistent w/NPR 8621.1
			Chapter 5.2	Added clarification to ensure feet are clear of floor obstacles and to contact Logistics for help with furniture.
			Chapter 5.8	Updates to be consistent with NPR 8715.3. Includes hard requirement for written tests, adding SCBA certification, clarification of training for category III jobs, and clarification of work shift limitations.
			Chapter 5.10	New chapter describing JSC Automatic External Defibrillator program.
			Chapter 6.5	Removed requirement for eyewash & shower for cryogenic areas.
			Chapter 6.6	Assigned responsibility for annual audits to the Safety & Test Operations Division. Changed Med Ops Branch to Space Medicine Division, removed redundant requirements.
			Chapter 6.9	Clarified requirements for operating procedures. Clarified that tests may proceed after TRR action item are complete. Revised time frame for submitting test documentation to Safety. Clarified mishap reporting requirements. Removed requirements for safety to sign detailed test procedures and to monitor physiological training. Added requirement for biosafety. Added reference to paragraph 1.14.2.b of NPR 8715.3 for offsite tests. Updated organizational titles and document numbers.

Change 2 to Rev J (cont.)	6/9//11	D. L. Clem, extension 34272	Chapter 6.10	Added requirements for controlled areas. Clarified def of JSC space. Added other clarifications.
			Chapter 6.11	Added clarification for commercial off-the-shelf flex hoses. Added clarification to requirements for gas cylinders.
			Appendix 6A	Added JSC Form 1023.
			Chapter 8.2	Clarified LO/TO exception for plug and cord electrical equipment.
			Chapter 8.5	Removed reference to JPD 8719.1.
			Chapter 8.6	Added requirement for training in the manufacturer's instructions.
			Chapter 8.7	Added clarification that fall protection is not required for small jobs from ladders.
			Chapter 9.1	Added URL for JSC list of restricted and prohibited chemicals.
			Attachment 9.1A	Deleted due to on-line list.
			Chapter 9.5	Updated document references.
			Chapter 10.3	Clarified coverage of URRs and ORIs. Added flowchart for criteria on URRs and ORIs. Added other clarifications.
			Chapter 10.4	Added clarification that Center-wide data is an acceptable means of maintaining facility baseline documentation, provided access methods are included in general operating procedures. Moved list in Attachment 10.4A to web page.
			Chapter 12.5	Clarified protective clothing for asbestos work.
			Chapter 12.7	Clarified definition of and added qualifications for a "competent person."
			Chapter 12.9	Added requirements for negative pressure enclosures.
			Chapter 12.15	Reclassified some spot removal of asbestos. Added requirements for removing plaster or sheetrock ceilings below ceiling plenum
			Attachments 12A, 12B, 12D, 12E	Updated to be consistent with requirements changes in asbestos chapters.
			Glossary	Replaced "Variance" with "Waiver." Added definition of Test Equipment," Revised mishap levels to be consistent with NPR 8621.1.
Administrative Changes	11-3-11	D. L. Clem, extension 34272	Chapter 12.15	Updated URL in paragraph 3.a.4 & made grammatical correction.

Administrative Changes	3-6-12	D. L. Clem, extension 34272	Chapter 5.9, Appendix 5A & 5B	Replace appendix forms with JSC form numbers.
Administrative Changes	4-25-12	D. L. Clem, extension 34272	Chapters 2.7, 3.6, 3.8, 5.8, 5.10, 5.10, 6.1, 6.5, 6.8, 6.10, 7.4, 8.1, 9.1, 9.3, 9.5, 10.1, 12.3, 12.14, Appendix 2B & 3B	Replace obsolete Ellington Field emergency number (x44444) with new emergency number (x33333) to match the emergency number at JSC and SCTF.
Change 3 to Rev J	4/26/12	D. L. Clem, extension 34272	Preface	Corrected outdated references.
			Chapter 1.0	Added policy paragraph for commercial activities.
			Chapter 2.3	Added option for use readiness review and reference to checklists.
			Chapter 2.7	Updated process for investigation boards and added references to checklists.
			Chapter 3.6	Updated office titles, updated emergency numbers, revised requirement for medical exams.
			Chapter 4.4	Clarified SATERN record of evacuation drills and JF 2150.
			Chapter 5.8	Added considerations for procedures and clarified certification card requirements. Removed limits to suited hard vacuum.
			Chapter 5.10	Changed “chest pains” to “heart attack symptoms, updated organization names and training requirements..
			Chapter 6.4	Updated inspection schedules.
			Chapter 6.7	Added considerations for handling process and references to checklists.
			Chapter 7.3	Added visiting product vendors and requests for evaluation of radiation.
			Chapter 7.4	Changed “Biosafety Control Board” to “Biosafety Review Board” and added requirements for the Board.
			Chapter 8.1	Defined elements of JSC electrical safety program per NFPA 70E to address IFO audit findings. Added other references to NFPA 70E.

Change 3 to Rev J (cont.)	4/26/12	D. L. Clem, extension 34272	Chapter 8.2	Added "operational control" concept for non-LO/TO and referenced appendix. Added clarifications for tagout only, removing locks, group lockout, and training per IFO audit findings. Added provision for orange locks with red shrink wrap for high voltage.
			Appendix 8B Chapter 9.2	Clarified process for issuing locks and added attachment for Operational Control.Added prohibition against transporting hazardous materials in POVs or taking them into the office. Clarified transfer of hazardous materials. Added requirements for updating MSDSs and MSDS databases. Updated training requirements. Clarified responsibility for providing information.
			Chapter 9.3	Added requirement to ventilate pesticide areas for 10 minutes before entering.
			Chapter 10.1	Changed Uniform Building Code to International Building Code. Clarified a "qualified electrical worker.
			Chapter 12.1	Updated planning and conduct of asbestos operations.
			Chapter 12.2	Added project design.
			Chapter 12.3	Updated sampling requirements.
			Chapter 12.4	Deleted incorrect document reference.
			Chapter 12.5	Updated training requirements, to include offsite contractors.
			Chapter 12.6	Added project design requirements.
			Chapter 12.7	Added requirements for Class III & Class VI competent persons.
			Chapter 12.8	Updated sampling requirements and CFR references.
			Chapter 12.9	Updated barrier requirements.
			Chapter 12.13	Updated disposal instructions.
			Chapter 12.14	Updated contact information for emergencies.
			Chapter 12.15	Added project design. Updated Job Performance Requirements.
			Appendix 12B	Updated Job Performance Requirements. Added Attachment 12H for Custodial Work.

JSC Directives System Procedural Requirements

Preface

Title: JSC Safety and Health Handbook

P1. Purpose

This document defines JSC's Safety and Health Program and provides basic safety and health requirements for the Johnson Space Center (JSC) and for other locations under JSC's jurisdiction. It is important that you follow the safety and health requirements that apply to your job.

P2. Applicability

This handbook applies to anyone at JSC or JSC field sites, unless exempted in a specific chapter. For this handbook, "JSC" includes all JSC sites in the Houston area such as Ellington Field and the Sonny Carter Training Facility. The handbook applies to operations involving JSC personnel or equipment at non-JSC locations, including foreign countries. See Chapter 1.4, paragraph 6, for more information on following standards at non-JSC locations.

a. The following table tells you who must follow this handbook.

If you . . .	***Then you shall follow . . .***
Are a federal employee	This handbook unless you work at a site that involves unique military equipment and operations
Are a JSC contractor	This handbook as called out in your contract. Prime contractors must flow down these requirements to subcontractors
Work at a JSC remote site (such as White Sands Test Facility) as a civil service employee or contractor employee	All chapters that don't exempt you and local requirements that meet the intent of any chapter that exempts you If a chapter exempts you, develop your own requirements that meet the intent of that chapter The local Quality Assurance, Reliability, and Safety Office or equivalent carries out the responsibilities of the Safety and Test Operations Division at your site
Are a non-NASA or non-contract employee	This handbook while you are on JSC property

b. If you are a federal employee working in a private employer's facility, you are covered by the JSC safety and health program. Although NASA may not have the authority to correct hazardous conditions in a private sector workplace, NASA makes sure your working conditions are safe and healthful. NASA does this by administrative controls or personal protective equipment, or your withdrawal from the private employer's facility.

c. If you are a private employer, neither Executive Order 12196, "Occupational Safety and Health Programs for Federal Employees," nor this handbook relieves you or your employees of any rights or responsibilities under the Occupational Safety and Health Administration (OSHA).

P3. Authority

a. NPD 8700.1, "NASA Policy for Safety and Mission Success"

b. NPR 8715.1, "NASA Occupational Safety and Health Programs"

c. NPR 8715.3, "NASA General Safety Program Requirements"

d. Executive Order 12196, dated February 26, 1980, "Occupational Safety and Health Programs for Federal Employees," (3 CFR 1980 Compilation)

e. 29 Code of Federal Regulations, Part 1960, "Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters"

P4. References

a. OSHA Instruction TED 8.4, "Voluntary Protection Programs (VPP) Policies and Procedures Manual"

b. 29 Code of Federal Regulations, Part 1910, "Occupational Safety and Health Standards"

c. NPD 1800.2, "NASA Occupational Health Program"

d. NPR 1800.1, "NASA Occupational Health Program Procedures"

P5. Cancellation

This handbook replaces JPR 1700.1I.

Chapter 1.0
JSC's safety and health program

1. JSC safety and health policy

The following is JSC's safety and health policy:

a. All mishaps can be prevented.

b. You must remove or control hazards at work.

c. Management will help you maintain a safe workplace.

d. Training employees to work safely is essential.

e. Your continued employment depends on working safely and watching out for others.

f. Working safely will result in the best possible performance.

2. JSC's safety and health program

JSC's safety and health program shall meet or exceed NASA, federal, and OSHA Voluntary Protection Program (VPP) requirements. JSC is a VPP Star site and continues to improve its program beyond minimum requirements. JSC's program is organized around the following four major elements:

a. Management Leadership and Employee Involvement (Part 1 of JPR 1700.1)

b. Worksite Analysis (Part 2 of JPR 1700.1)

c. Hazard Prevention and Control (Part 3 of JPR 1700.1)

d. Safety and Health Training (Part 4 of JPR 1700.1)

Each major element is divided into sub-elements as described in each chapter or Parts 1–4. Parts 5–11 of JPR 1700.1 provide requirements for working safely and healthfully.

Basic requirements and rights

3. Basic requirements of JSC's safety and health program

The following requirements are basic to JSC's safety and health program:

a. Management leadership and employee involvement from all line organizations is critical to the success of JSC's program. Without your commitment and participation, JSC's safety and health program cannot function to provide a safe and healthy workplace and reach our goal of zero injuries. Safety and health is an integral part of each manager's responsibilities and of each employee's job.

b. JSC will continually strive to meet its goal of zero injuries. To remain in VPP, we need to maintain 3-year average rates for injuries and illnesses that are below the most recent national average for JSC's Standard Industrial Classification Code. The Bureau of Labor

Statistics publishes these averages. Note: When the Bureau of Labor Statistics changes to the North American Industry Classification System (NAICS), JSC will compare its rates to the rates generated under NAICS.

c. JSC shall take all practical steps to avoid loss of life, injury to personnel, property loss, mission failures, and test failures. Every JSC team member, full-time or part-time, is entitled to a safe and healthful workplace.

d. Even though this is everyone's responsibility, personnel from the Safety and Mission Assurance Directorate and the Occupational Health Branch have authority to stop any operations that pose a clear, present, and unwarranted danger to any person or NASA property. Don't resume these operations until the danger is removed.

e. We need to have open lines of communication between safety and health personnel and other disciplines, such as product and quality assurance, biomedical operations and research, life sciences projects, and human factors projects.

f. JSC's safety and health program shall be proactive rather than reactive. This means preventing mishaps by finding and controlling hazards before mishaps occur.

g. We need to thoroughly assess and reduce or accept risk to NASA personnel, equipment, and operations. At no time will we violate federal safety and health requirements in accepting risk. See paragraph 1.6 of NPR 8715.3.

h. We need to pay special attention to facilities involving multiple organizations, contractors, and shifts. In these facilities:

   1. Clearly define safety and health responsibilities.

   2. Promptly communicate safety and health information to all people.

i. We need to learn from our mistakes, constantly improve our program, and share our lessons with others.

4. Your rights under JSC's safety and health program

At JSC you have the same rights under the Occupational Safety and Health Administration (OSHA) as you would at any workplace, including the right to contact OSHA with any safety or health concern you feel you cannot resolve at JSC. As a JSC employee or manager, you have the right to:

a. Stop or refuse to do any task if you believe that:

   1. It will put you or your coworkers at risk of sudden death or serious injury.

   2. There is no time to resolve the matter through normal hazard reporting channels.

b. Leave any area where imminent danger conditions exist as described in subparagraph a above.

c. Report hazards and have your name kept confidential as described in Chapter 2.6 of this Handbook. This includes the right to contact OSHA about safety and health concerns.

d. Be a member of, or be represented on, safety and health committees.

e. Participate in safety or health activities without having to take leave.

f. Be trained about the hazards of your job and how to protect yourself.

g. Have access to the following on request:

   1. Safety and health requirements that apply to your job

   2. Your medical exposure records and protection of your records under the Privacy Act of 1974

   3. JSC's Log and Summary of Occupational Injuries and Illnesses (OSHA Form 300)

   4. Results of inspections, hazard evaluations, and mishap investigations

h. Have information about JSC's safety and health program.

i. Comment on NASA and JSC occupational safety and health requirements.

j. Be free from restraint, interference, coercion, discrimination, or reprisal for:

   1. Reporting hazards.

   2. Participating in safety and health activities.

   3. Exercising any other rights you have from this Handbook or federal law.

5. Recourse if your rights are denied

You have the full protection of the law should your rights be denied or threatened. This includes freedom from reprisals. NASA will respond promptly and fully to alleged denials or reprisals. The following apply:

a. If you are a civil service employee, you may file a complaint or grievance. Your Human Resources representative can help you with the details. There are two official venues for filing a complaint or grievance:

   1. Grievance procedures in the agreement between JSC and the American Federation of Government Employees (AFGE) or in agreements with other recognized labor organizations

   2. The NASA Office of the Inspector General

b. "Reprisals," or punitive sanctions or actions taken against you by any individual or entity for participating in the JSC safety and health program in any way, are illegal and subject to personnel action and possible prosecution. The Coordination Safety and Health Committee and JSC Management Council (JMC) shall be told of any allegations of reprisal.

c. JSC shall send findings on any investigations of reprisal to NASA Headquarters and OSHA.

d. If you are a contractor, contact your safety and health office, your bargaining unit, or the JSC Safety and Test Operations Division.

6. Public safety

We shall take measures to protect the general public from injury or illness from JSC operations by eliminating or controlling risks to the public. This includes public events on NASA property. Protecting the public includes:

a. Analyzing JSC operations for hazards to the public and eliminating the risk to the public or providing protective measures when the risk cannot be eliminated.

b. Restricting access to hazardous areas at JSC.

c. Working with the outside communities to make the public aware of hazards from JSC operations.

d. Working with local officials on emergency planning and community safety activities.

7. Commercial Activites

Commercial entities that utilize NASA facilities for other than NASA-sponsored activities shall, at a minimum, comply with all applicable Federal, State, local requirements and all applicable national consensus standards. Applicable standards used in lieu of NASA provisions are referenced in this handbook and other standards may also apply. As a minimum, the NASA hazard analysis and review processes (chapters 2.3, 2.4, 6.9, and 10.3) apply. A Use Readiness Review (chapter 10.3), Test Readiness Review (chapter 6.9), or equivalent review (chapter 2.3) shall determine which more stringent NASA requirements apply to specific operations. The NASA facility management organization shall use the NASA hazard analysis and review process to ensure that all commercial operations in NASA facilities will not adversely affect NASA personnel, NASA contractor personnel, NASA assets, and the public.

8. Safety and health records

The safety and health records listed in this Handbook document that we are following our safety and health program. Some records are center-level and some are organizational. You shall follow the current versions of JPR 1440.3, "JSC Files and Records Management Procedures," for keeping, archiving, or destroying records. Appendix 1 of this Handbook contains a summary of center-level, contractor, and organizational records JSC is required to maintain.

Committees and responsibilities

9. Safety and health committees

The following Safety and Health committees oversee JSC's safety and health program and provide avenues to resolve safety and health issues:

a. The ***JSC Management Council*** is responsible for overseeing JSC's Safety and Health Program as a part of the overall management of the center.

b. The ***Safety and Health Coordination Committee*** supports the JMC by working safety and health issues and recommending providing direction, policy, strategy, and goals related to safety and health. See Chapter 1.1 for more information.

c. The ***JSC Safety Action Team*** is an employee-run committee where employees can actively participate in providing inputs to, and resolving, safety and health issues. See Chapter 1.9 for more information.

d. The ***Contractor Safety Forum*** is a contractor-run committee to review and resolve contractor safety issues and to provide inputs to JSC's safety and health program. The Contractor Safety Forum will work with the other JSC committees to investigate and resolve safety issues.

10. Top management responsibilities

Responsibility for safety and health begins with top management. The following is a list of general responsibilities for top management in addition to the general responsibilities of line managers in paragraph 11 of this chapter. Other chapters of this Handbook list responsibilities for specific elements or tasks:

a. As the ***Director***, ***JSC***, you have the ultimate responsibility for providing a safe and healthful workplace at JSC and you responsible for:

   1. Delegating the day-to-day safety and health responsibility to the Designated Safety and Health Official.

   2. Approving variances to JSC safety and health requirements as described in Chapter 1.4.

b. As the ***Deputy Director***, ***JSC***, you are the Designated Safety and Health Official for JSC. At each JSC field office, the office manager is the alternate designated safety and health official for that office. You are responsible for:

   1. Providing resources, guidance, and direction for implementing JSC's safety and health program.

   2. Making sure JSC's safety and health program is implemented per federal and NASA requirements.

   3. Making sure JSC has independent safety and health organizations to help, and ensuring that line organizations carry out JSC's safety and health program. These organizations include safety and health officials at appropriate levels and adequate

personnel to carry out JSC's safety and health program. This includes Certified Safety Professionals and Certified Industrial Hygienists.

4. Making sure specialized expertise from other sources are available as necessary.
5. Making sure all JSC organizations have adequate budgets to carry out JSC's safety and health program.
6. Making sure JSC has requirements and procedures to carry out JSC's safety and health program.
7. Making sure JSC has goals and objectives to reduce mishaps.
8. Making sure JSC evaluates its safety and health program effectiveness.
9. Setting priorities for correcting workplace hazards.

c. As an ***Organizational Director*** (or a Manager of a Directorate-level Office), you are responsible for fulfilling the responsibilities of a line manager as described below and you are also responsible for:

1. Making sure JSC's safety and health program is implemented in your Directorate or Office. This includes developing and documenting a process to meet the requirements of paragraph 1.1.4 of this Handbook.
2. Designating a representative for the Coordination Safety and Health Committee.

11. JSC team member responsibilities

You are a JSC team member if you do any work at JSC or JSC field sites. The term "team member" includes all civil service and contractor employees (full time, part time, and temporary), all levels of civil service and contractor management, and any other workers on JSC property. As a JSC team member, you are responsible for your own safety and health and for looking after the safety and health of other JSC team members. You are required to fulfill the responsibilities listed in other chapters of this Handbook that apply to your job. Your general responsibilities are:

a. Following safety and health standards, rules, regulations, and guidelines issued by OSHA, NASA, and JSC.

b. Correcting hazards yourself, if possible, use established procedures to report and correct hazards.

c. Seeking prompt medical care if you suffer a job-related injury or illness.

d. Promptly reporting mishaps (hardware, injuries, and illnesses) and close calls.

e. Cooperating with safety and health personnel during inspections, surveys, and investigations.

f. Using personal protective equipment when required to do so by safety and health standards, hazard evaluations, good work practices, or your supervisor.

g. Being able to describe your individual responsibility for safety and health.

h. Doing your job safely and responsibly.

i. Making sure that visitors you escort are aware of the hazards in the areas they will visit and taking appropriate measures to protect themselves.

j. Making sure that you are properly trained and qualified to safely perform your duties.

12. Line manager responsibilities

You are a line manager if you have any leadership responsibilities over employees, projects, or work areas. Line managers include all levels of management from the Director, JSC, to Team leads or equivalent contractor levels. You are required to fulfill the JSC team member responsibilities listed in paragraph 10 above and the responsibilities listed in other chapters of this Handbook that apply to your job. Your general responsibilities are:

a. Setting an example of good safety and health practices by:

   1. Showing an interest in safety and health.
   2. Being involved in safety and health activities.
   3. Having strong personal safety and health awareness.

b. Providing visible leadership in safety and health by:

   1. Showing your commitment to safety and health.
   2. Following up on safety and health matters.
   3. Attending safety meetings within your organization and including safety and health agenda items in your meetings.

c. Providing a safe and healthful workplace by:

   1. Protecting your employees in imminent danger situations.
   2. Identifying hazards through hazard analyses, inspections, or other methods and controlling identified hazards as your resources allow. This includes hazards to the public.
   3. Making sure your employees follow the safety and health requirements that apply to their jobs.
   4. Making sure your employees immediately report hazards and mishaps to you.
   5. Making sure your employees receive appropriate medical care when injured at work.
   6. Making sure your employees and visitors to your work areas know the hazards in their workplace and duties, and what precautions they need to take to protect themselves (e.g., safety devices, caution and warning devices, and personal protective equipment).

7. Enforcing safe practices. Reprimand employees for unsafe behavior, if necessary. Reward employees for excellent safety and health performance.

d. Making sure your employees know about:

1. JSC's safety and health program and the protection it gives them.
2. Their rights and responsibilities from this chapter and federal law (e.g., Executive Order 12196, 29 CFR 1960, "Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters," and 29 CFR 1977, "Discrimination Against Employees Exercising Rights Under the Williams-Steiger Occupational Safety and Health Act of 1970").
3. How they can participate in safety and health activities.
4. Disciplinary actions they can face for unsafe behavior.
5. What to do in all emergencies.

e. Reporting lessons you learn about safety and health to the Safety and Test Operations Division, Occupational Health Branch, and other organizations that may benefit.

f. Making sure that you have a budget for such things as correcting hazards in your work areas and buying required safety equipment.

g. Cooperating with and helping safety and health personnel.

13. Facility manager responsibilities

As a facility manager, you are responsible for safety and health in your facility as well as fulfilling other facility responsibilities your management may assign. For more information, see the Facility Manager's Support Page at http://www6.jsc.nasa.gov/ja/fmod/facilitymanagers.cfm. You are required to fulfill the JSC team member responsibilities listed in paragraph 10 above and responsibilities listed in other chapters of this Handbook that apply to your job. Your general responsibilities are:

a. Coordinating safety and health in your facility, including areas between organizational lines.

b. Making sure that your facility and all operations in your facility follow federal, NASA, and JSC requirements.

c. Coordinating with building occupants and the Center Operations Directorate, as necessary, to resolve facility-related safety and health issues.

d. Making sure your building has a poster that tells you about NASA's and JSC's safety and health program. The Safety and Test Operations Division will provide a poster that meets 29 CFR 1960.12(c), "Dissemination of Occupational Safety and Health Program Information."

e. Posting safety and health information and reports in your facility as necessary.

14. Contractor responsibilities

Contractors are a major part of JSC's workforce. All contractor employees and managers are JSC team members. Chapter 1.8 of this Handbook covers the process of selecting and overseeing safe contractors. Companies with JSC contracts are responsible for developing and maintaining safety and health programs that:

a. Follow all requirements that apply to private sector employers, such as OSHA, state, and local requirements as well as NASA or JSC requirements imposed by contract.

b. Flow appropriate safety and health requirements to their subcontractors.

c. Protect other JSC team members who may be impacted by their operations.

15. Visitor and guest researcher responsibilities

As a visitor or guest researcher, you are responsible for:

a. Making sure your work doesn't interfere with JSC facilities or operations.

b. Knowing and following all safety and health requirements for the area where you are working. This includes using any required personal protective equipment.

c. Being trained and certified for any hazardous operations you will be doing.

d. Completing other occupational health and safety training, as necessary, to meet OSHA, NASA, and JSC requirements; e.g., hazard communication, lockout/tagout, and laser safety.

e. Ensuring you get approval before bringing hazardous materials, radioactive materials, or biological agents on site.

f. Before beginning work, getting any required reviews and approvals for the type of work you will do, especially where there are impacts to JSC operations (e.g., hot work or work with radiation or radioactive materials, chemicals, or biological agents).

16. Safety and Test Operations Division (NS) responsibilities

The Safety and Test Operations Division is responsible for:

a. Overseeing safety at JSC.

b. Supporting the line organizations as they implement JSC's safety and health program.

c. Developing and maintaining selected center-wide safety processes such as mishap and close-call reporting.

d. Providing safety training for JSC employees.

e. Making sure NASA Safety Reporting System posters are posted in major buildings.

f. Developing and maintaining a management system for tracking and advancing JSC's safety goals.

17. Occupational Health Branch (SD3) responsibilities

The Occupational Health Branch is responsible for:

a. Overseeing occupational medicine and health at JSC.

b. Supporting the line organizations in their occupational health responsibilities.

c. Developing and maintaining selected center-wide health processes and programs such as hearing conservation, respiratory protection, ergonomics, hazard communication, hazardous materials, and confined space entry.

d. Providing occupational health training for JSC employees.

e. Evaluating work areas for health hazards, and communicating results to management and employees.

f. Developing and maintaining a management system for tracking and advancing JSC's health goals.

g. Communicating risk to management.

Handbook information

18. Conflicts between this Handbook and the safety or health requirements of your organization

This Handbook takes precedence over all other JSC documentation in safety and health, except for more stringent requirements that individual JSC organizations develop. The following requirements apply:

a. If your organization has more stringent requirements than are in this Handbook, you shall follow them.

b. In the case of differences between the requirements of this Handbook and other NASA, federal, state, or local requirements, you shall follow the more stringent requirements.

c. If you find any less stringent JSC requirements than are in this Handbook, or any differences between the requirements of this Handbook and other NASA, federal, state, or local requirements, bring them to the immediate attention of the JSC Director, the Safety and Mission Assurance Directorate, or the Space Life Sciences Directorate.

19. How to use this Handbook

You don't need to read this entire Handbook. You need to be familiar with the elements of JSC's safety and health program, and the requirements that apply to your job. Use the Handbook to find specific requirements, as you need them. This Handbook contains several features to help you find the requirements you need:

a. Table of contents and index

b. Subject index

c. Chapter titles

d. Chapter introductions that tell you who has to follow that chapter

20. Which parts of this Handbook you need to follow

You need to be familiar with all elements of JSC's safety and health program in Parts 1–4, You are required to follow any part of this Handbook that applies to your job. The table below tells you which parts apply to what job. You will find a similar table in the first chapter of each part.

If your job or facility operations involve . . .	***Then you shall follow . . .***
Any work at JSC or JSC field sites	Part 5, Safety and health practices for everyone
Working with batteries Working with lasers Working in warehouses Preparing or serving food Working with cryogenic liquids or gases Handling new or unique hardware Working in chemical or research laboratories Doing test operations Entering confined spaces Working with compressed gases	Part 6, Safety and health requirements for certain hazardous tasks
Working in noisy areas Wearing a respirator Working with ionizing or nonionizing radiation Coming in contact with biohazards, blood, or body fluids	Part 7, Health protection practices
Working in machine shops Working with electricity Welding, cutting, or brazing Lifting materials Working with hand or power tools Working on ladders, scaffolds, or elevated platforms	Part 8, Safety and health practices for manufacturing, installation, repair, and maintenance
Working with or transporting hazardous materials	Part 9, Safety and health practices for hazardous materials
Designing or constructing JSC facilities Operating hazardous or complex facilities	Part 10, Safety and health practices for JSC facilities and facility systems
Overseeing contracts or grants at JSC Participating on a Source Evaluation Board	Part 11, Safety and health requirements for JSC contracts and purchases

If your job or facility operations involve . . .	*Then you shall follow . . .*
Working near or with asbestos-containing materials	Part 12, Asbestos Control Requirements

Chapter 2.3
Pre-use analysis

1. Applicability of this chapter

You are required to follow this chapter if you are a line manager at any level.

2. Description of Sub-element 2.3

JSC shall analyze all newly acquired or altered facilities, processes, materials, equipment, or phases before use begins to identify safety and health hazards, environmental impacts, and the means to prevent or control them.

3. Requirements

JSC handles pre-use analyses as follows:

a. For new or modified facilities and proposed programs or projects (such as Construction of Facilities, and lesser funding levels):

   1. Safety, health, and fire protection engineers shall review the drawings and participate in design reviews. All new or modified facilities require at least acceptance inspections and tests of fire protection systems. See Chapter 10.1 of this Handbook for more details.

   2. You shall make sure an environmental review is done during the planning phase as described in JPR 8550.1, "JSC Environmental Compliance Procedural Requirements." The "environmental review" is required by the National Environmental Policy Act (NEPA) to identify and assess the potential environmental effects for proposed programs and projects. The Project Manager conducts the environmental review during the earliest planning stages, before the point when NASA's ability to implement reasonable alternatives is precluded.

b. Hazardous, unique, or critical facilities require an operational readiness inspection or use readiness review as described in Chapter 10.3 of this Handbook. Hazard analyses are included.

c. Less hazardous facilities may have a less rigorous readiness review that uses Chapter 10.3 of this Handbook as a guide. Hazard analyses are included. The following checklists are available to document a review and may be customized to the situation:

   1. New equipment checklist at URL: http://www6.jsc.nasa.gov/safety/Checklists/docs/New_Item_Cklist.docx.

   2. Configuration management checklist template at URL: http://www6.jsc.nasa.gov/safety/Checklists/docs/Config_Change_Cklist.docx.

d. Ground tests that could pose hazards to test subjects or test personnel shall have a Test Readiness Review as described in Chapter 6.9 of this Handbook. Hazard analyses are included.

e. Hazardous materials require a hazard analysis as described in Chapter 9.1 of this Handbook.

f. Employees in potentially hazardous jobs shall have a Job Hazard Analysis as described in Chapter 2.4 of this Handbook.

4. Responsibilities

Responsibilities for pre-use analyses are as follows:

a. As a ***line manager,*** you are responsible for:

   1. Making sure the analyses in paragraph 3 above are done as required.
   2. Making sure the Safety and Test Operations Division and the Clinical Services Branch are involved in evaluating any new facilities, equipment, materials, or processes and any changes to your facilities, equipment, materials, or processes.

b. The ***Center Operations Directorate*** is responsible for:

   1. Notifying the Safety and Test Operations and Clinical Services Branch of plans for new or modified facilities, and providing drawings and notice of design reviews.
   2. Conducting environmental reviews according to JPR 8550.1.

c. The ***Safety and Test Operations Division*** and the ***Clinical Services Branch*** are responsible for:

   1. Reviewing facility drawings for safety and health.
   2. Supporting design reviews, Test Readiness Reviews, and operational readiness inspections as needed.

5. Safety and health records

Records to document pre-use analyses may include:

a. For new or modified facilities, center-level records include:

   1. Design review of documentation and acceptance test and inspection records kept by the Center Operations Directorate.
   2. Records of safety and health comments kept by the Safety and Test Operations Division or Clinical Services Branch.
   3. Records of the NEPA environmental reviews kept by the Environmental Office.

b. If an operational readiness inspection is done on a facility, the organization that owns the facility shall keep a copy of the operational readiness inspection package as described in Chapter 10.3 of this Handbook.

c. For less hazardous facilities, where a less rigorous readiness review was done, the organization that owns the facility shall keep a copy of the review package.

d. Organizations that do hazardous ground testing that could pose hazards shall keep Test Readiness Review documentation.

e. Hazard analysis, as described in Chapter 2.4 of this Handbook, also supports this sub-element.

Chapter 2.7
Mishap and Incident Investigation

1. Applicability of this chapter

You are required to follow this chapter if you:

a. Work at JSC or a JSC field site as a civil servant or contractor.

b. Are a line manager, facility manager, contractor safety representative, director, or temporary official in charge of a mishap scene. Paragraph 20 of this chapter lists your responsibilities. Paragraph 20 of this chapter also lists the responsibilities of JSC's Center Director and the Director, Safety and Mission Assurance.

c. Paragraph 21 of this chapter lists the responsibilities of the Safety and Test Operations Division, the Clinical Services Branch, the Security Branch, the Legal Office, the Public Affairs Office, the Information Systems Directorate, contracting officers, and technical representatives.

2. Description of Sub-element 2.7

JSC shall have a system to investigate mishaps and incidents that:

a. Includes written procedures or guidance.

b. Trains investigators.

c. Produces written reports of findings.

d. Tracks hazard elimination or controls to completion.

e. Seeks the underlying causes of the mishap or event to prevent recurrence and avoids blaming the employee.

f. Covers "close-call" incidents.

g. Provides feedback and lessons learned to employees.

3. What this chapter excludes

This chapter covers how to report and investigate mishaps during JSC ground operations. It excludes the following:

a. Emergency response to a mishap. You can find those requirements in Chapter 3.8.

b. Liability, disciplinary action, or program direction.

c. Response to spaceflight mission failures.

Reporting mishaps and close calls

4. Actions if a mishap or close call occurs

If a mishap occurs in your area, you shall follow these steps (see also Attachment 2.7A, Appendix 2B for more information):

a. Call your emergency number if the mishap is an emergency. Emergencies include:

1. Mishaps that cause major injuries to one or more persons or major property damage.
2. Mishaps that result in a condition that is immediately dangerous to life or health.
3. Any unplanned or uncontrolled hazardous material spills or releases.
4. Any unplanned fire or explosion.
5. Mishaps that require prompt emergency response.

Remember, your emergency numbers are: x33333 at JSC, Sonny Carter Training Facility, and Ellington Field, 9-1-1 at any off-site location, and x5911 at White Sands Test Facility.

b. Prevent further injury, damage, or environmental spill or release.

c. Secure the mishap scene.

d. Safeguard mishap evidence.

e. Report the mishap or close call as described in paragraph 5 or 6 of this chapter.

f. If you think the mishap could involve death, permanent disability, hospitalization of three or more persons, or damage greater than or equal to $500,000, contact the Safety and Test Operations Division, the Safety and Mission Assurance Directorate, or the Center Director's Office immediately. NASA Headquarters and OSHA require JSC to report these mishaps immediately.

g. Refer news media inquiries to the JSC Public Affairs Office.

The Director of Public Affairs is the only person allowed to coordinate releases of information to the news media.

5. Reporting close calls

Report close-call events where no injury, property damage, or environmental spill, release, noncompliance, or nonconformance occurred on JSC Form 1257 or the electronic form in the IRIS (when available). See Chapter 2.6 for more information; the investigation will follow this chapter. At JSC, a ***close call*** is an event that could have caused injury, property damage, or environmental release, spill, noncompliance, or nonconformance, but didn't. For example, someone falls from a ladder and is not injured, someone almost gets cut because a machine guard is missing, or a spill almost occurs because a lid is missing from a waste containment

drum. Close calls may result from hazards or unsafe acts. The Safety and Test Operations Division will assign an RAC for close call-reports as described in Chapter 3.2, "Hazard Elimination And Control," paragraphs 3–5 of this Handbook. Report actual damage and environmental remediation costs under $1000 on NASA Form 1627, even though NASA Headquarters defines it as a "close call."

6. Reporting a mishap

A mishap is an event that causes unplanned or unexpected injury, property damage, or impact to the environment; e.g., death or injury to a test subject and irreparable damage or impact to natural or cultural resources are mishaps. Failure of a test object isn't a mishap if you expected the failure to occur as a result of the test. The supervisor of the injured employee or the manager in charge of the area where damage or a hazardous material release or spill occurred is responsible for making sure the mishap is reported. However, anyone who witnesses the mishap may report it. You shall report all mishaps except those excluded by paragraph 1.2.2 of NPR 8621.1, "NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping." To report a mishap:

a. You shall fill out an initial written report within one working day on NASA Form 1627 (Part A only) and send it to the Safety and Test Operations Division or use the electronic form in IRIS (when available). For injuries or illnesses, sending an injured or ill employee to the JSC Clinic will automatically initiate an injury report (JSC Form 340). There is no need to fill out an initial report if the injured employee goes to the JSC Clinic. Then, complete any additional information requested by the Safety and Test Operations Division within one working day. This includes a NASA Form 1627, which is based on the JSC Form 340, until the electronic entry form in IRIS is available.

b. You shall follow up with your investigation results within 2 weeks.

c. You shall also report the mishap to your facility manager as soon as possible.

d. You may report the mishap immediately to the Safety and Test Operations Division by telephone.

e. You shall report at least the following mishaps (civil service or contractor) to your higher management and, ultimately, to the Center Director who notifies NASA Headquarters:

    1. Any Type A or B mishap involving damage, injury, or death. Immediately call the Center Director, Deputy Director, or Director. Safety and Mission Assurance. JSC shall notify Headquarters within 1 hour.

    2. Any injury or illness involving lost work days. Notify the Center Director to allow Headquarters notification within 24 hours.

    3. Any non-occupational fatality on site, such as one due to a heart attack. These cases won't be recorded, but the Center Director shall notify Headquarters within 24 hours.

    4. Any serious injury or illness off the job. Reporting is voluntary on the part of the employee or family. These cases won't be recorded.

f. You shall report mishaps that occur in foreign locations as described in paragraphs 7, 8, and 9 of this chapter.

Close calls and mishaps at international locations

7. Close calls and mishaps at international locations

You shall report:

a. Any injury or occupational illness to JSC civil service or contractor personnel.

b. Any damage to JSC equipment.

c. Close calls where JSC personnel could have been injured or JSC equipment could have been damaged.

8. How to report a close call or mishap at an international location

If a mishap occurs, follow the reporting process in this chapter as closely as your situation will allow. Call the JSC Safety and Test Operations Division at (281) 483-2084 during normal JSC duty hours (central time) or the JSC Emergency Operations Center at (281) 483-4658 outside of normal JSC duty hours to report the mishap. You shall:

a. Report the mishap to JSC via telephone within 1 hour if it involves death, serious injury, or property damage exceeding $500,000.

b. Report the mishap via telephone within 24 hours if it involves other injuries or property damage less than $500,000, or if it's a close call.

c. Report the mishap or close call to your Directorate management as soon as possible.

d. Fax a mishap report (NASA Form 1627) to the Safety and Test Operations Division or the electronic form in IRIS within 24 hours at (281) 244-0983 for mishaps that involve injury or property damage.

e. Fax a close-call report (JSC Form 1257) to the Safety and Test Operations Division or the electronic form in IRIS within 24 hours at (281) 244-0983 for close calls.

9. What to do if you are injured at work while on foreign travel

You shall report to the JSC Clinic on your first business day after returning to work at JSC. This will allow the clinic personnel to make sure you have recovered or will recover, and to update your medical records.

10. Investigating mishaps in foreign countries

Your organization and the Safety and Test Operations Division will make sure the mishap is investigated under NASA requirements and international agreements.

Investigating mishaps

11. How to investigate a mishap as an individual or member of a small team

All mishaps require an investigation. The Environmental Office takes the lead for mishap investigations that are strictly environmental, and will help line management with other investigations that involve environmental issues. Line managers or facility managers may delegate an investigation to employees or employee teams. The investigation results, to include action plan or rationale why no action is necessary, are due within 2 weeks of the mishap unless you request an extension through the Safety and Test Operations Division. To investigate a mishap you shall:

a. Start your investigation as soon as all emergencies are under control. You may ask the Safety and Test Operations Division for help. A Safety and Test Operations Division representative may already be on the way to the scene. Providing medical help to injured persons and preventing further injury or damage take priority over the steps listed below. After a mishap, you shall first:

   1. Identify potential witnesses and get statements from them.
   2. Secure the mishap scene and protect it from being disturbed.
   3. Safeguard evidence such as samples and photographs.
   4. Secure all records such as checklists, videos, and electronic data.

JSC's Center Director may appoint a mishap investigation board to investigate your mishap. If he or she appoints a board, you shall stop your investigation, keep the mishap scene and evidence secure, and cooperate with the board.

If you think a mishap investigation board should investigate your mishap, contact the Safety and Test Operations Division.

b. Refer any news media personnel that ask about the mishap to the Public Affairs Office.

The Director of Public Affairs is the only person who is allowed to coordinate releases of mishap information to the news media.

c. Consult any experts you need to sample the mishap scene or analyze the data.

d. Interview witnesses. You shall keep witness statements confidential. Guidelines for witness interviews are available at URL: http://www6.jsc.nasa.gov/safety/mishaps/docs/MIB/MIB_Witness_Guidelines.pdf.

e. Examine all evidence and analyze all mishap data to the appropriate investigation level described in paragraph 12 below. You may also use the current version of the checklists at http://www6.jsc.nasa.gov/safety/Mishaps/docs/general/MishapInvestigationChecklist.pdf and http://www6.jsc.nasa.gov/safety/Mishaps/docs/MIB/MIB_Checklist.pdf as guidelines.

f. Document the results of your investigation and action plan or actions taken. Submit the results to the Safety and Test Operations Division as follows:

   1. Provide the required products for the mishap type listed in figure 5 and paragraph 1.7 of NPR 8621.1 "NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping."
   2. Document the results of mishap investigations, where there is an injury or any damage, on an electronic investigation form you receive via electronic mail, NASA Form 1627, or in IRIS. Include any additional documentation required in NPR 8621.1.
   3. Document the results of a close-call investigation (no injury or damage) on the close-call response form provided when the investigation is assigned or in IRIS.

g. The investigator's supervisor shall review and concur with the results of mishap investigations. The close-call reporter will have an opportunity to review and comment on the results of close-call investigations.

h. Have your facility manager concur on the proposed action if the mishap involved the building or hazardous materials.

i. Document lessons learned as described in paragraph 16 of this chapter.

j. Work the action plan and track to closure as described in paragraph 13 of this chapter.

Don't use your investigation to find fault, determine disciplinary action, or defend JSC from lawsuits. Your investigation is only to prevent the mishap from happening again.

12. Investigation levels for mishaps and close calls

When you investigate a mishap or close call, you shall find the cause(s) of the mishap or close call and decide what actions you will take to eliminate or control the hazard. The basic process for investigating Type C or D and "Close Call" mishaps is in Attachment 2.7B, Appendix 2B. See Attachment 2.7D of Appendix 2B for more details on OSHA and NASA mishap categories. Contact the Environmental Office for mishaps that are strictly environmental. Take the following steps to investigate a mishap or close call:

a. For Type C mishaps – Lost time injuries (including restricted duty injuries), damage greater than or equal to $50,000 and less than $500,000:

   1. Do a full root cause analysis using an established root cause method. The cause may be simple, but try to look beyond the obvious. Perhaps the hazard was caused by some deficiency in the management system. Perhaps it was caused by human error, which resulted from deficiency in the management system. As a minimum, you shall use the Mishap Investigation Checklist in Attachment 2.7C, Appendix 2B. You may use other root cause methods and provide documentation in a standard Microsoft Office or PDF format.

2. Evaluate the root causes and determine which ones you need to fix to prevent injuries or future hazards.
3. Develop an action plan to change, control, or prevent those root causes from causing injuries or future hazards. The plan may involve one item or many. Remember to turn in work requests, if necessary. If your investigation shows that no action is necessary, you shall provide rationale.
4. Provide the products required for Type C mishaps listed in figure 5 and paragraph 1.7 of NPR 8621.1 "NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping," in a commonly available electronic format such as PDF or Microsoft Office software.

b. For other injuries and damage cases, RAC 1 and 2 close calls, and RAC 3 and 4 close calls that involve an event (as opposed to merely reporting a hazard):

1. Determine the root cause(s). Avoid blaming the employee without looking into the cause. The obvious cause may be that the employee didn't follow procedures. However, this may have happened because there were no procedures or because management didn't train the employee in the procedures. As a minimum, you shall use the Mishap Investigation Checklist in Attachment 2.7C, Appendix 2B. You may use other root cause methods and provide documentation in a standard Microsoft Office or PDF format.
2. Develop an action plan to address the causes. Your action plan may involve one item or many. Remember to turn in work requests, if necessary. If your investigation shows that no action is necessary, you shall provide rationale.
3. Provide the products required for Type D mishaps and close calls listed in figure 5 and paragraph 1.7 of NPR 8621.1, "NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping," in a commonly available electronic format such as PDF or Microsoft Office software.

13. Taking action after an investigation

The following rules apply to action plans developed during mishap and close-call investigation:

a. If you assign actions to other organizations such as the Center Operations Directorate to modify the building or the Clinical Services Branch to sample the work area, contact those organizations ahead of time. If they don't refuse the action within 5 working days, they have accepted the action. It is their responsibility to complete the actions.

b. If you or another organization wants to change any estimated completion dates for any actions, you shall get approval from your director.

c. The Safety and Test Operations Division will track actions in IRIS until they are completed and verified.

d. Verification of completed action will be as follows:

1. For lost time mishaps (including restricted duty cases) or mishaps involving damage greater than or equal to $50,000 and less than $500,000, the Facility Manager shall first verify completion and the Safety and Test Operations will follow up with an independent verification.
2. For less serious mishaps than those mentioned in subparagraph d.1 above and RAC 3 or 4 close calls, the Facility Manager verification will be sufficient to close the mishap or close call. The Safety and Test Operations Division may also follow up with an independent verification.

14. Mishap investigation boards

Mishap investigation boards are a formal method for investigating serious or potentially serious mishaps or close calls. Mishap investigation boards shall follow NPR 8621.1, which also specifies when an investigation board is required. Investigation board checklists are available at URL: http://www6.jsc.nasa.gov/safety/mishaps/docs/MIB/MIB_Checklist.pdf. Guidelines for interviewing witness are available at URL: http://www6.jsc.nasa.gov/safety/mishaps/docs/MIB/MIB_Witness_Guidelines.pdf.

15. Contractor mishaps and mishaps investigated by outside agencies

Contractors will investigate mishaps (including environmental mishaps) that involve only contractor personnel or equipment at an off-site location as described in their contracts and in paragraph 1.10.5 of NPR 8621.1. Contractor mishaps involving injury to NASA personnel or property shall be investigated as outlined in this chapter. JSC may accept investigations by outside agencies, such as OSHA or law enforcement agencies, as described in paragraph 1.10 of NPR 8621.1. JSC personnel shall support these investigations as needed.

Other requirements and responsibilities

16. Sharing lessons learned from mishaps or close calls

When you finish your investigation, decide whether you have any lessons learned to share with other organizations that would prevent them from having a similar safety, health, or environmental mishap.

a. If you have any lessons learned, you shall attach them to your final mishap or close-call report when you send the report to the Safety and Test Operations Division. Enter the lessons learned into the NASA Lessons Learned system at http://llis.gsfc.nasa.gov. See paragraph 7.6 of NPR 8621.1.

b. The Safety and Test Operations Division shares lessons learned with:

   1. JSC employees and organizations that would benefit through means such as alerts, announcements, or special reports.

2. Organizations outside JSC that would benefit through the Government Industry Data Exchange Program, product safety bulletins, or other means.

17. Notification of mishaps

If a mishap occurs:

a. he Safety and Mission Assurance Directorate shall make notifications per NPR 8621.1.

b. JSC shall follow JPD 1712.1 "Management Notification Policy for Use in the Event of Serious Illness, Injury, or Death," current version.

18. Training for mishap investigators

Mishap investigators shall have the following training:

a. "Introduction to Mishap Investigation" on SATERN (Site for On-Line Learning and Resources), course number SMA-00x-05.

b. "Root Cause Analysis" through the JSC Safety Learning Center or the NASA Safety Training Center.

19. For more information on reporting and investigating close calls and mishaps

You can find more information on reporting and investigating close calls and mishaps in these documents:

a. NPR 8715.1, "NASA Safety and Health Handbook, Occupational Safety and Health Programs."

b. Letter UO, dated August 6, 1993, "Federal Agency Recordkeeping" from the Director of Occupational Health and Aerospace Medicine Division, NASA Headquarters.

c. JSC 05900, "JSC Emergency Preparedness Plan" including all annexes.

d. JPD 1382.1, "Release of Information to News Media," current version.

20. Individual responsibilities for reporting and investigating mishaps

a. ***Line managers*** are responsible for:

1. Making sure close calls and mishaps in your area are reported as described in paragraphs 5 and 6 of this chapter.

2. Investigating all Type C mishaps, incidents, and first-aid injuries as described in paragraph 12 of this chapter.

3. Taking necessary actions to correct hazards discovered during your investigation as described in paragraph 13 of this chapter. This includes temporary measures to protect

your employees and the environment while you wait on building or equipment changes. Improve on your action periodically.

4. Supporting mishap investigation boards as necessary.
5. Always reminding your employees that reporting close calls and mishaps is necessary. Reward those who promptly report close calls and mishaps, and reprimand those who don't.
6. Monitoring the recovery of any employee with a lost time injury. Arrange for that employee to return to work on light or restricted duty as soon as possible.
7. If the mishap results in a death or personal injury requiring immediate hospitalization or in damage estimated to exceed $10,000 to Government or private property, refer to NPR 3792.1, "NASA Plan for a Drug-Free Workplace," to determine whether additional action outside the safety mishap reporting and investigating process should be taken.

b. As a ***contractor safety representative***, you are responsible for helping contractor or NASA management with close-call and mishap reporting and investigation as necessary.

c. As a ***facility manager***, your knowledge of your facility is important to a mishap investigation. You are responsible for:

1. Responding to close calls and mishaps that occur in your facility.
2. Making sure close calls and mishaps that occur in your facility are reported and investigated.
3. Investigating close calls. Support mishap investigations as necessary.
4. Making sure that employees in your facility know about action plans and lessons learned.

d. An ***Organizational Director*** at JSC is responsible for:

1. Developing processes for reporting and investigating close calls and mishaps that occur in your Directorate.
2. Reviewing open close-call or mishap reports in your Directorate and making sure that they are closed in a timely manner.
3. Providing services from your Directorate that other JSC organizations need to correct hazards found during investigations such as testing, evaluating data, modifying buildings or equipment, or sampling work areas.
4. Being aware of mishaps in your Directorate and notifying the Deputy Center Director of lost time mishaps.

e. If JSC's Center Director appoints you ***temporary official in charge of a mishap scene***, you are responsible for:

1. Overseeing the mishap scene until a mishap investigator or board takes over.
2. Keeping the Director, Safety and Mission Assurance, or Center Director informed of your status.

3. Cooperating with the incident commander at the scene of a hazardous material spill. The incident commander is in charge of the scene.

f. The ***JSC Center Director*** is responsible for:

1. Being the chief spokesperson for all JSC mishaps with local, state, and federal authorities and the news media through the Public Affairs Office.

2. Supporting investigations of NASA mishaps by other federal agencies that have authority to investigate NASA mishaps (such as the National Transportation Safety Board) for aircraft mishaps and the U. S. Department of Labor for occupational mishaps). Support investigations of mishaps experienced by other federal agencies, foreign governments, and private industry per agreements.

3. Appointing a temporary official in charge of a mishap scene for major mishaps if necessary. The temporary official in charge will usually be: for JSC mishaps, the Safety and Mission Assurance Director; for aircraft mishaps, the aviation safety officer of the Flight Crew Operations Directorate; or, for mishaps at JSC field sites, the chief of the local quality assurance, reliability, and safety office.

4. Making sure the temporary official in charge of a mishap scene gets necessary support until the mishap investigator or board takes over.

g. The ***Director, Safety and Mission Assurance,*** is responsible for:

1. Notifying JSC senior management and other organizations of all immediately reportable mishaps as described in paragraph 17 of this chapter.

2. Recommending to JSC's Center Director how mishaps should be categorized (such as Type A or B) and investigated.

3. Notifying the Office of the Inspector General (OIG) and the Office of the Chief Counsel immediately if it is reasonably suspected that a mishap resulted from criminal activity so that the OIG and chief counsel can appropriately coordinate their activities with the responsible workplace official.

4. Review mishap investigation board reports from other centers to determine applicability to JSC. Recommend actions as appropriate.

h. ***Contracting Officers and their technical representatives*** are responsible for:

1. Making sure that JSC contractors understand and follow NASA and JSC contract requirements for reporting and investigating close calls and mishaps.

2. Including applicable mishap and close-call reporting and investigating procedures detailed in the NASA Federal Acquisitions Regulations Supplement into contracts covering NASA programs and operations.

21. Organizational responsibilities for reporting and investigating mishaps

a. The ***Safety and Test Operations Division*** is responsible for:

1. Providing JSC with a list of personnel trained in mishap investigations.
2. Keeping records of close-call and mishap reports and investigations and tracking all items to completion.
3. Coordinating with the Environmental Office on environmental mishap and close-call investigations.
4. Helping with close-call and mishap investigations and actions as necessary.
5. Reviewing and approving close-call and mishap reports and action plans. Evaluate reports for possible lessons learned.
6. Verifying that actions are completed.

b. The ***Environmental Office*** is responsible for:

1. Helping the Safety and Test Operations Division with environmental mishap and close-call investigations.
2. Helping the Safety and Test Operations Division to review and approve environmental mishap and close-call reports and action plans
3. Evaluating close-call and mishap reports for possible environmental lessons learned.

c. The ***JSC Medical Clinic*** (Clinical Services Branch) is responsible for:

1. Filling out JSC Form 340 when an employee has an injury or illness on the job. Send copies to the Safety and Test Operations Division and the injured employee's supervisor or company.
2. Informing the employee's supervisor and the Safety and Test Operations Division immediately of a fatality or a suspected disabling injury or illness
3. Providing any necessary occupational health and industrial hygiene support required by other JSC organizations to fulfill any of the responsibilities of this chapter.
4. Providing medical or pathological information required to fulfill the requirements of this chapter under the Privacy Act of 1974.

d. The ***Security Branch*** is responsible for:

1. Making sure that mishap scenes are secured.
2. Making sure that evidence and important information are preserved for the investigation.
3. Investigating motor vehicle accidents.

e. The ***Legal Office*** is responsible for:

1. Having ground rules to protect the privileged status of witness statements, witness testimony, or other matters related to a mishap.
2. Reviewing mishap information or reports before they are released from JSC control to make sure the facts are correct and can be released.

f. The ***Public Affairs Office*** is responsible for:

1. Preparing releases of any mishap information to the news media or other organizations outside JSC under JPD 1382.1, "Release of Information to News Media," current version.
2. Having the JSC Legal Office and anyone else connected with the mishap, such as the mishap investigator or board chairperson, review information to make sure the facts are correct and can be released.
3. Protecting the privileged status of witness statements, witness testimony, and other matters related to a mishap under Legal Office ground rules.
4. Following procedures for public announcements by NASA found in agreements with other agencies or contractors when releasing mishap information.
5. Coordinating information releases as described in paragraph 3.9 of NPR 8621.1.

g. The ***Information Resources Directorate*** is responsible for providing photographic and other information services on a priority basis when needed by mishap investigations.

22. Safety and health records

The following records document mishap and incident investigation:

a. Center-level – The Safety and Test Operations Division shall maintain:

1. Copies of NASA Form 1627.
2. A tracking database to track mishap data, investigation, and closeout.
3. Mishap information and submit to IRIS.
4. Copies of JSC mishap investigation board reports and supporting material such as procedures, minutes, tape recordings, etc.
5. A log of occupational injuries and illnesses, OSHA Form 300 as described in Appendix 1.
6. The Annual Summary of Federal Occupational Injuries and Illnesses on OSHA Form 300 as described in Appendix 1.

b. Organizational-level – As a line manager, you are encouraged to keep records on mishaps in your work areas to include copies of completed NASA Form 1627 and any supporting documentation.

23. Measurement

The following factors measure mishap and incident investigation:

a. Timeliness of mishap reporting.

b. Timeliness of investigation and follow up.

Chapter 3.6
Occupational health care program

1. Applicability of this chapter

You are required to follow this chapter if you work at or visit JSC. If you work at a JSC field site, follow your local procedures and requirements that meet the intent of this chapter. Paragraph 18 of this chapter also lists the responsibilities of line managers, the JSC Clinical Services Branch, JSC's Occupational Health Contractor, and JSC's Medical Clinic ("The Clinic").

2. Description of Sub-element 3.6

JSC shall have an occupational health care program that:

a. Uses licensed health care professionals to assess employee health status for prevention of, and early recognition and treatment of, illness and injury. JSC has a comprehensive occupational, preventive, and emergency medicine clinic to provide screening exams and treat illnesses and injuries.

b. Provides, at a minimum, access to employees certified in first aid and cardiopulmonary resuscitation (CPR). Emergency medical technicians are available through the JSC Clinic during normal business hours.

c. Provides physician care and emergency medical care for all shifts within a reasonable time and distance. The JSC Clinic provides physician and emergency medical care during normal business hours. Outside of normal business hours, emergency medical care is available to JSC employees at local hospitals.

3. JSC field sites

JSC field sites are responsible for providing occupational health care that meets the intent of this chapter.

Medical treatment and "Clinic First" policy

4. What to do if you or a coworker suffers an injury or illness on the job

JSC has a "Clinic First" policy. You shall seek prompt medical attention and notify your supervisor. Whenever you are involved in a mishap, seek medical treatment for the injured person, come to the "clinic first" before doing anything else. The following requirements apply:

a. Depending on the severity of the medical condition, either escort the injured or ill person to the JSC occupational medicine clinic or call the emergency numbers listed below.

If you are unsure about the severity of the injury or illness, call your emergency number. Remember your emergency numbers are:

x33333 at JSC, Sonny Carter Training Facility, and Ellington Field
911 at any off-site location
x5911 at White Sands Test Facility

Reporting emergency situations is mandatory.

b. If you are a supervisor, you shall:

1. Make sure the injured or ill employee receives prompt medical care.
2. Report the mishap and support the investigation as described in Chapter 2.6 of this Handbook.
3. Work with the case management nurse to determine the work status of the injured or ill employee.
4. Assist the employee so that he or she may return to work as soon as reasonably possible.

5. If you think you've been exposed to a hazardous material or condition

Whether you notice any symptoms or not, you shall report the incident to the clinic and to your supervisor immediately. This will allow your condition to be evaluated and treated if necessary. This will also ensure that others who may have been exposed can be identified and evaluated.

6. Working outside of normal working hours

The JSC Clinic operation hours are from 0730 to 1630, Monday– Friday. If you or a coworker suffers an injury or illness outside of these hours:

a. Depending on the severity of the medical condition, either call the emergency numbers or access medical care at a local health care facility.
b. As soon as possible, report any job-related injury or illness to your supervisor and the JSC Clinic.
c. Report to the JSC Occupational Medicine Clinic for follow-up.

7. If you don't notice a job-related injury or illness until you are off duty

You shall report it to your supervisor and the JSC Occupational Medicine Clinic at the beginning of the next business day.

8. If you see your own doctor or go to a hospital for a job-related injury or illness

You shall report your doctor visit to your supervisor and the JSC Occupational Medicine Clinic as soon as possible. If you are on travel or off site, call your supervisor and have him or her call the clinic.

9. Workers' compensation

For workers' compensation information:

a. Civil servants – Contact the nurse case manager at x31132. (See Attachment 3.6A, Appendix 3B.)

b. Contractor employees – Follow your company policies or contact your human resources office.

10. Moving an injured or ill person to a clinic or hospital

Depending on the severity of the medical condition of the injured or ill employee, call the emergency numbers or notify your supervisor. If the injury or illness is minor, escort the injured or ill employee to the JSC Occupational Medicine Clinic. If unsure of the severity of the medical condition, call the emergency numbers. The injured or ill employee has the right to refuse transport or any additional medical care.

11. First-aid kits

JSC has a comprehensive occupational and emergency medicine clinic that is available Monday through Friday 0730–1630 to treat minor, on-the-job injuries and illnesses. JSC requires that all injuries and illnesses be reported under our "clinic first" policy. However, supervisors may want first-aid kits in areas where there is a special need because of a specific hazard or a chemical that warrants a specific antidote be closely available. The following is JSC's policy on first-aid kits and antidotes:

a. If you believe your area requires a first-aid kit or an antidote, contact the Clinical Services Branch (SD3) at x34317 and provide a name and phone number who will serve as the point of contact (POC). SD3 will use the following guidelines to substantiate your request:

   1. Do workers engage in hazardous activities on second or third shift when the JSC Clinic is closed; e.g., machine shops, printing, etc.?

   2. Does the workplace have a specific chemical hazard that warrants an antidote to be close by? For example, dermal hydrofluoric acid exposure requires immediate treatment with a neutralizer such as calcium gluconate. Hydrogen cyanide gas inhalation requires immediate treatment with amyl nitrate.

   3. Is the facility remote from the JSC Clinic, such as Ellington Field or the Sonny Carter Training Facility?

b. If the request is approved, the Clinical Services Branch will furnish a completely stocked kit. The location, POC, and phone number will be posted on the kit.

c. The facility manager will be responsible for performing and annotating quarterly inventories and obtaining replacement supplies from the JSC Medical Supply (x37897) as required. Replace any expired, used, or damaged supplies immediately.

d. Employees who will use first-aid kits in the workplace shall be trained in the use and limitations of the first-aid supplies. First-aid supplies are for self-treatment only, except when a specific chemical antidote is needed. Someone other than the exposed employee usually applies the antidote. Employees who are required to administer antidotes may also need to be put into a bloodbourne pathogen program. Even if you use first aid in the workplace to treat a minor injury, you are still required to report to the JSC Occupational Medicine Clinic as soon as reasonably possible afterward to ensure adequate treatment.

12. Case management – returning to work after an injury or illness from your job

The following processes and requirements apply to case management:

a. At JSC, the Nurse Case Manager (x34111) will help coordinate follow-up medical treatment and return to work. After completing an assessment, the medical professionals, who include the Nurse Case Manager, determine fitness for duty. The determination will consider your private doctor's input. The determination will be lost time, restricted duty, or return to work. In special cases, arrangements can be made to accommodate the employee at home or work. This determination will be communicated to you and your supervisor, and the facts and outcome will be documented in your medical files.

b. Your supervisor and the medical and human resources offices shall be involved in the case management of your on-the-job injury or illness and successful return to work. They shall be involved in the process from the initial injury to the final return to work at 100% of your capabilities. The JSC Nurse Case Manager will work with both you and your management chain to discuss your initial diagnosis, duty status (lost time, restricted duty, or return to work), and any other information necessary to help successfully return you to work.

c. Contractors are expected to have case management personnel (Health Professionals, Human Resources, Loss Control, etc.) to help in the case management process for their employees.

d. If you work at a JSC field site, follow site-specific policies.

Medical surveillance

13. Medical surveillance

Medical surveillance includes medical screening examinations and procedures used to protect workers who may be exposed to hazardous substances or processes. It also shows that

workers are physically and mentally fit to do certain hazardous or critical operations. Data gathered to establish a baseline parameter may help to recognize and treat occupational illnesses and injuries. Medical surveillance includes:

a. Identifying workers who need examination.

b. Performing and documenting those examinations.

c. Informing workers of the results.

d. Training.

e. Evaluating data for trends and sub-clinical effects of exposure.

14. Requirements for placing you in a medical surveillance program

JSC uses a "hazard-based" method to decide which jobs or operations require medical surveillance. The need for medical surveillance is based primarily on regulatory or local requirements, or exposures determined by industrial hygiene surveys. You may be required to have a physical examination because of your job, such as a painter, or because of some task you do, such as wear a respirator. You may also receive a "Fitness for duty" medical examination for specific job descriptions (such as flight controller). You shall be under medical surveillance if:

a. You could be exposed to a physical, chemical, or biological hazard at or above the action level set by OSHA or the American Conference of Governmental Industrial Hygienists (ACGIH). This is usually half of the permissible exposure limit (OSHA) or the threshold limit value (ACGIH).

b. You are required to be under medical surveillance by a standard that covers the chemical you will be working with.

c. The Clinical Services Branch decides whether you need an examination based on knowledge of the workplace, job requirements, and review of occupational history.

15. Physical examinations at JSC

JSC's medical surveillance program includes the following physical exams:

a. A ***baseline examination*** before you start work (or within the timeframe required by OSHA or NASA-specific standards) in a job that could expose you to hazardous materials to:

   1. Determine whether you are suitable for the job.

   2. Provide a baseline so medical personnel can later see any changes to your condition.

b. A ***periodic examination*** while you are working in a job that could expose you to hazardous materials.

c. A ***termination examination*** when you quit your job or are permanently removed from a job that could expose you to hazardous materials. It is important to document your state of health when you leave in case you later develop medical problems that could be a result of some exposure to hazardous materials.

d. A ***certification examination*** if your job might make existing health problems worse, or if the safety of others depends on your health. These exams are critical to controlling and eliminating occupational injury and illness, and to making sure certain employees can do their hazardous jobs safely. Check the personnel requirements for your work area to see if you need a certification examination.

16. Requesting a medical screening examination

Your supervisor shall request an examination using the following process. There are some exceptions to this process, such as a Respiratory Physical. Your supervisor is current on the specific process to be used. To request a medical exam:

a. Send JSC Form 270, "Johnson Space Center, Job-Related Physicals," to the JSC Occupational Medicine Clinic, mail code SD38. JSC Form 270 is available on the JSC Homepage. The request shall include:

   1. Your name, birth date, job description, and phone number (your title and the building you normally work in would also be helpful).
   2. Your supervisor's name and mail code.
   3. Justification for the examination; identification of the toxic material you will work with, and the requirement that says you need the examination.
   4. What kind of physical examination you need from paragraph 14 of this chapter.

b. Request the physical exam a minimum of 2 months before the expiration date of the current physical (for individuals currently in the system).

c. Wait for the clinic to contact you with a scheduled appointment. The clinic will do this after the Clinical Services Branch authorizes the proper physical examination protocol and sends your request to the clinic.

d. Report to the clinic for your examination. Fill out work history and exam questionnaires for the kind of physical examination you need. It is important that you fill out all forms completely to allow the doctor to properly perform the examination. You may pick up the forms in advance and complete them before your examination if reading or writing in English is difficult for you.

17. Requirements for physical examinations

The following table lists the requirements for exams by job or duty. The Clinical Services Branch reviews the medical surveillance program periodically and may change the frequency of physical examinations for certain job descriptions based on current medical

recommendations or changes to regulatory requirements. This table doesn't list all work areas and jobs that may require medical surveillance. Medical surveillance requirements change because of the age of the employee, changes in work procedures that reduce exposure to chemicals or hazards, or changes in regulations.

Job or Duty	***Baseline Exam Req'd?***	***Periodic Exam Req'd?***	***Term Exam Req'd?***	***How often?***
Test subject engaged in Level I or II tests (mandated by the Institutional Review Board); for example microgravity flyers and Crew and Thermal Systems Division (CTSD) chambers	yes	yes	yes	yearly*
NBL Working Divers	yes	yes	yes	yearly*
Lock observers	yes	yes	yes	yearly*
Self-contained atmosphere protective equipment (SCAPE) operators, closeout crew	yes	yes	yes	yearly*
Rescue personnel	yes	yes	yes	yearly
Test subjects not engaged in Level I or II tests	yes	yes	yes	every 3 years*
Pressure suit engineer or technician	yes	yes	yes	every 3 years*
Microgravity test conductors and guests	yes	yes	yes	every 3 years*
NBL Guest Divers	yes	yes	yes	every 3 years*
Chamber directors, operators, and conductors	yes	yes	yes	every 3 years*
Crane Operators/Riggers Note: Includes ground floor, remote operation, high, cabin, pulpit	yes	yes	yes	Every 2 years
Propellant handlers	yes	yes	yes	yearly
Pesticide and herbicide handlers	yes	yes	yes	yearly
Insulators	yes	yes	yes	yearly
Asbestos workers**	yes	yes	yes	yearly
Solderers for flight or ground support equipment	yes	yes	yes	yearly
Hazardous material emergency responders	yes	yes	yes	yearly

Job or Duty	*Baseline Exam Req'd?*	*Periodic Exam Req'd?*	*Term Exam Req'd?*	*How often?*
Painters	yes	yes	yes	yearly
Plating shop workers or metal finishers	yes	yes	yes	yearly
Food handler	yes	yes	yes	yearly
Welders	yes	yes	yes	yearly
Metal workers: lead, cadmium, etc.	yes	hazard based	yes	***
Fuel cell operator	yes	yes	yes	yearly
Clean room worker	yes	yes	yes	yearly
Primary contact	yes	yes	yes	yearly
Flight controllers	yes	yes	yes	age less than 40 every 2 years and yearly thereafter
Primary contact (food depot)	yes	yes	yes	every 6 months
Sheet metal workers	yes	hazard based	yes	***
Class 3b and 4 laser users or workers	yes	no	yes	***
Respirator users	yes	yes	yes	****
Handling any other chemical, physical, or biological agent	***	hazard -based	***	***
Working in high-noise areas	yes	yes	yes	yearly
Hypervelocity gun operators	yes	yes	yes	yearly
Hurricane Rideout Team	yes	yes	no	yearly
Confined Space Entrants (OSHA Permitted Spaces Only)	yes	yes	no	***
Astronauts and Mission Specialists	yes	yes	yes	annually

*Pre-test physical examination given as necessary by test requirements.
**Someone who does class I, II, or III asbestos work (as defined in 29 CFR 1926.1101) for more than 30 days per year, where a "day" is more than 1 hour of work. Those who do asbestos work for less than 30 "days" a year are considered respirator users for medical surveillance.
***The Clinical Services Branch will decide.
****Age less than 35, every 5 years. Age between 35 and 45, every 2 years. Yearly thereafter.

18. Responsibilities for occupational health care

Responsibilities for occupational health care are as follows:

a. If you are a ***line manager***, you are responsible for:

1. Training your employees in JSC's "clinic first" policy.
2. Making sure your employees know where and how to get medical treatment.
3. Making sure your employees report all injuries or illnesses on the job to you.
4. Making sure injured or ill employees go to the clinic.
5. Making sure your employees know what to do when they see their own doctor or go to a hospital for a work-related injury or illness.
6. Consulting with the Clinical Services Branch if you think you need first-aid kits for your employees.
7. Making sure your employees have the required baseline medical examination before assigning them to a work area or job task.
8. Making sure all your employees are current on all required medical examinations.
9. Contacting the Clinical Services Branch before starting any new process or changing existing processes so that medical surveillance requirements can be addressed.

b. The ***Clinical Services Branch*** and ***JSC Occupational Medicine Clinic*** are responsible for:

1. Determining fitness for duty of injured or ill employees as described in paragraph 12.
2. Reporting all injuries and illnesses (JSC Form 340) thought to be work related to the Safety and Test Operations Division.
3. Investigating suspected work-related illnesses and exposures.
4. Telling the Safety and Test Operations Division if an injury or illness will prevent an employee from doing his or her job, and when an employee may return to work without restrictions.
5. Providing physical examinations, as required, for on-site civil servant and contractor personnel.
6. Conducting industrial hygiene evaluations of work areas to determine whether hazard-based work-related physical examinations are necessary.
7. Making recommendations on the need for medical surveillance for new jobs.
8. Providing trained emergency medical paramedics and ambulance services as First Responders. Backup up assistance is through a Mutual Aid arrangement with the Houston Fire Department.
9. Assessing and treating anyone with a job-related illness or injury. Assessing and treating any medical emergency that happens on site, whether it is job related or not.

10. Supporting Flight Medicine.

11. Supporting human tests with emergency response and ambulance services.

19. Safety and health records

The following records document occupational health care:

a. Center-level – The JSC Occupational Medicine Clinic shall keep treatment and exam records. This includes protecting employee medical files under the Privacy Act of 1974 and considering them privileged information.

b. Organizational-level – Line managers shall keep a current roster of employees requiring enrollment in medical surveillance and medical screening programs.

Chapter 4.4
Emergency training

1. Applicability of this chapter

You are required to follow this chapter if you work at or visit JSC or a JSC field site.

2. Description of Sub-element 4.4

JSC line managers, non-supervisory employees (including contractor employees), and visitors on site shall understand what to do in emergency situations.

3. Fire drills

The emergency you are most likely to encounter at JSC is a fire in your building. Training for fire evacuation includes a yearly fire drill for your building. If you are in the building during a fire alarm, you shall evacuate the building as described in Chapter 3.8. Whether this is a drill or a real alarm, it will count as an evacuation drill. The following requirements apply:

a. The building's chief fire warden will receive notice stating the date and time of the drill. If the drill cannot be conducted when scheduled, it shall be rescheduled. Fire drills are not normally announced to building occupants in advance.

b. Floor fire wardens are responsible for all occupants involved in a fire drill and for seeing that drill procedures are followed.

c. When everyone has evacuated the building and is accounted for, a uniformed Fire Protection Specialist from the Safety and Test Operations Division will declare the drill terminated and notify building occupants that they may return to the building.

d. Any actual evacuation caused by a fire protection system, whether real or due to a malfunction, will count as an annual drill.

e. Employees shall record their fire drill participation in SATERN.

4. Make-up fire drills and fire evacuation training

If you are out of the building during a fire drill, your supervisor shall provide evacuation training, which includes:

a. A review of the evacuation route and procedures and any lessons learned from the fire drill, plus special considerations if you are physically challenged.

b. Ensuring that you have exercised an emergency evacuation and are familiar with the designated assembly area.

c. Make-up fire drills and fire evacuation training that are only required once a year, regardless of how many times the alarm sounds in the building.

5. Other emergency training

Emergency training shall include:

a. A yearly briefing on the current emergency action plan (Chapter 3.8) for your building or work area as part of an office safety meeting. This briefing shall emphasize employee protective measures for hazards identified in the Emergency Action Plan.

b. Additional training for certain buildings or work areas that have potential emergencies beyond fire evacuation. If you work in one of these buildings or areas, you shall:

   1. Receive training in emergency procedures for your building or work area.

   2. Participate in emergency drills to reinforce the training at least once a year, or more frequently if required.

6. Visitor training

All visitors shall view the videotape at Building 110 and review the information on the visitor badge card before coming on site. If you are escorting visitors in your work area, you shall inform them of any special emergency procedures and make sure they follow those procedures if an emergency occurs.

7. Responsibilities

Responsibilities for emergency training are as follows:

a. As a ***line manager,*** you are responsible for making sure your employees:

   1. Participate in a fire drill or receive fire evacuation training at least once a year. Keep a record of those employees who need a make-up drill as described in paragraph 4 above. You may use JSC Form 2150 for this record.

   2. Record their fire drill participation on SATERN.

   3. Are aware of other emergencies that could happen in their work areas and the procedures to respond to those emergencies. This may include formal training as necessary.

   4. Participate in any other emergency drills required for their work areas.

b. The JSC Security Office is responsible for providing safety and health information to visitors via the visitor badge card.

c. If you escort visitors, you are responsible for making sure the visitors understand what to do in any emergency that could occur in their work areas.

7. Safety and health records

As a line manager, you shall maintain the following organizational-level records to document your emergency training:

a. SATERN record of employee fire drill participation.

b. JSC Form 2150, "Building Evacuation Accountability Record," or equivalent record, to document those employees who need make-up fire evacuation training.

c. Records of other required emergency training or emergency drills in your work areas.

Chapter 5.8
Hazardous operations: safe practices and certification

This could be you . . .

An employee was working on a water tower base without using the buddy system or checking the air quality and was overcome due to an oxygen deficiency.

Another employee was dispensing a chemical through a liquid sprayer, which he had done numerous times before based on his training. Unfortunately, he failed to read the current MSDS, which indicate that, there had been a change in the chemical make-up; this resulted in an allergic reaction to the new chemical composition.

Contaminated solder was used in a space shuttle component because there were no requirements to certify solder technicians.

1. Applicability of this chapter

You are required to follow this chapter if you do or oversee any hazardous operations at JSC or JSC field sites. Paragraph 19 lists the responsibilities of supervisors, line managers, safety representatives, certified confined space supervisors, contracting officers, the Safety and Test Operations Division, the Clinical Services Branch, and the Employee Development Branch.

2. Hazardous operations

A hazardous operation is a job that involves hazardous materials, conditions, or equipment that could result in injury or property damage if you don't follow special precautions.

Requirements for hazardous operations

3. Requirements for any hazardous operation

If you do or oversee hazardous operations, you shall:

a. Decide which category—I, II, III, or IV—your operation belongs in and follow the appropriate certification requirements. See paragraphs 4, 5, 6, and 7 of this chapter.

b. Inform your organizational director of the risks involved in any new or non-routine hazardous operation with the potential for death, serious injury, or loss of critical high-dollar-value hardware before you start.

c. Make sure, as a supervisor, that everyone follows any requirements that apply to the

operation or that are listed on the permit.

d. Use the "buddy system" with at least one standby person in one of these ways:

   1. One of you does the job and the other watches from the immediate area of the job to make sure the "worker" is safe.

   2. Two of you do the job and you keep in constant contact with a standby person electronically, mechanically, or visually. The standby person shall remain in the immediate area where you are working.

   3. Two of you do the job and you keep in contact with a standby person by coded lifeline signals even though you may be out of sight of the standby person. The responsible safety representative will decide how many worker and standby person combinations there need to be.

e. Take extra care, as a supervisor, to recognize and respond to dangerous situations when:

   1. Your employees work in hazardous areas they aren't normally assigned to.

   2. Your employees are working near public access areas.

4. Requirements for Category I hazardous operations

Category I jobs involve operations that are likely to either cause death or serious injury or high-dollar property damage for JSC. Category I jobs include, but are not limited to, those listed in the table on the following page. Chapter numbers given are for chapters in this Handbook. For Category I jobs, you shall have at least the following:

a. Classroom or on-the-job training or both for initial certification, and then as needed.

b. Written examination. Many chapters in this Handbook and other requirements list training requirements for certain operations.

c. Annual retraining that will include review of emergency response and first-aid procedures.

d. Recertification as required or as necessary.

e. Permits (hazardous operations permit (HOP), hot work permit (HWP), or confined space entry permit (CSE)) or physiological training if necessary.

f. Physical examination if required by the Clinical Services Branch. See Chapter 3.6, "Occupational Healthcare Program," of this Handbook for more details on physical examinations. Physiological training may also be required.

For these personnel or operations . . .	*Permit req'd . . .*	*Physio trng req'd?*	*Med. exam req'd?*	*Follow requirements in . . .*
Working on an aircrew	none	yes	yes	n/a
Operating aircraft engine test cells (T-38 aircraft sound suppression facility)	none	no	yes	n/a
Operating a crane	HOP, for heavy lifts	no	some, see Chapter 3.6	Chapter 8.5
Handling explosives or pyrotechnics (ordnance category)	HOP	no	no	Chapter 9.5
Handling propellants	HOP	no	yes	Chapter 9.5
Rescue personnel	none	yes	yes	n/a
SCAPE operators	none	no	yes	n/a
Scuba diving and operating neutral buoyancy tanks	HOP	no	yes	Chapter 6.6
Handling pesticides, insecticides, or herbicides	HOP	no	yes	Chapter 9.3
Test directors and subjects	none	yes*	yes	Chapter 6.9
Test conductors and engineers	none	yes*	yes	Chapter 6.9
Washing windows on multistoried buildings	none	no	no	Chapter 8.7
Handling lithium cells or batteries	none	no	no	Chapter 6.1
Working in confined spaces	CSE	no	yes**	Chapter 6.10

*Required for human occupied hyperbaric and hypobaric activities only.
** Required only for entry into OSHA permitted confined spaces.

5. Requirements for Category II hazardous operations

Category II jobs involve operations that, if not done correctly, could create a severe hazard to the operator or user, other personnel, or property. The requirements for Category II jobs are similar to those for Category I jobs. You may reduce the levels of physical examination, training, and testing because of the lower hazard levels. Your organization shall determine the certification and recertification requirements with the concurrence of the Safety and Test Operations Division or the Clinical Services Branch. Category II jobs include, but are not limited to, those listed in this table. Chapter numbers given are for chapters in this Handbook.

For these personnel or operations . . .	*Permit req'd . . .*	*Physio trng req'd?*	*Med. exam req'd?*	*Follow requirements in . . .*
Operating altitude chambers	HOP	yes	yes	Chapter 6.9
Operating heavy equipment and rigging loads	none	no	yes	Chapter 8.5 and equipment manuals
Operating high-pressure liquid, vapor, or gas systems	none	no	no	n/a
Working with high-voltage electricity	HOP	no	no	Chapters 8.1 and 8.2
Servicing and maintaining equipment with hazardous energy	none	no	no	Chapter 8.2
Operating hyperbaric chamber	HOP	yes	yes	Chapter 6.9
Operating powder-actuated tool	HOP	no	noise only	Chapter 8.6
Using radioactive materials or radiation-producing equipment (ionizing and nonionizing)	HOP	no	no	Chapter 7.3
Operating boiler plants	none	no	noise only	n/a
Operating aerial baskets and truck platforms	HOP	no	no	Chapter 8.7
Working with insulation	none	no	yes	n/a
Operating Class 3B and 4 lasers or solar simulators	HOP	no	yes	Chapter 6.2 (laser only)
Handling cryogenics	HOP	no	no	Chapter 6.5
Pressure suit technicians	none	yes	yes	n/a
Welding (fusion) on flight ground-support equipment	HWP	no	no	Chapter 8.4 and JSC 18323
Hand or automated wire wrapping	none	no	no	MIL-STD-130b
Hand soldering for flight and ground-support equipment	none	no	yes	NASA STD-8739.3
OSHA Class I, II, or III asbestos work	yes	no	yes	Chapter 5.7 and Part 12
Using Self Contained Breathing Apparatus	no	no	yes	n/z

6. Requirements for Category III hazardous operations

Category III jobs involve handling, transporting, and packaging of hazardous materials that do not disturb the integrity of the basic shipping container. Operations that involve the reduction of palletized or otherwise combined items of packaged hazardous materials qualify

as handling. Category III jobs require training, certification, and a hazardous operations permit unless you have a procedure as described in paragraph 13 of this chapter. Your organization will determine the certification period with concurrence from the Safety and Test Operations Division, or the Clinical Services Branch if none is required by state or federal laws. You shall:

a. Have specific training in federal, NASA, and JSC rules for preparing, packaging, marking, and transporting the material you will handle. Training shall include instruction in how to find both the specific hazards of the material(s) and the standard emergency and first-aid procedures to follow if a spill or exposure to the material occurs. This shall also include a review of the Material Safety Data Sheet(s) before handling or transporting any material.

b. Pass a written test to show you have the necessary knowledge and skills.

c. Get a certification card and carry it. The card shall include name, date, materials you may handle, signature of certifying officer, and expiration date.

7. Requirements for Category IV hazardous operations

Category IV operations require a hazardous operations permit unless you have a procedure as described in paragraph 13 of this chapter. Medical exams are only required for certain operations. See Chapter 3.6 for more information on medical exams. Category IV jobs include, but are not limited to, those listed in this table. Chapter numbers given are for chapters in this Handbook.

For these personnel or operations . . .	***Follow requirements in . . .***
Hot work	Chapter 8.4 and paragraph 8 below
Working in acoustic and vibration chambers	Chapter 6.9
Working in acceleration facilities	Chapter 6.9
Working in impact testing facilities	Chapter 6.9
Working in oxygen-enriched or oxygen-deficient atmospheres	n/a
Demolition	29 CFR 1926.850
Using pneumatic and power-actuated devices that incorporate projectiles	Chapter 8.6
Excavation	29 CFR 1926.650 and 1926.651
Proof pressure-testing components or systems	n/a
Transferring, transporting, using, disposing of, or otherwise exposing personnel to cryogenic substances, explosives, radiation, etiological agents, flammable or combustible liquids or solids, propellants, poisons, corrosive or oxidizing materials, or compressed gases	Chapter 5.1 Chapter 8.5 Chapter 9.1

Transporting oversized loads or trailers that would require special permits on public roadways	Chapter 5.3
Working at heights of 20 feet or more	Chapter 8.7
Using "heavy lift" material handling equipment	Chapter 8.5
Doing hazardous waste operations	29 CFR 1910.120 40 CFR Parts 260–279

8. Work shift limits for hazardous operations

These limits prevent dangerous situations due to fatigue. They apply to those who are doing hazardous activities as well as to those who are responsible for activities that could result in death, injury, or property damage:

a. If you do any hazardous operations, you shall:

   1. Never work a shift of more than 12 hours in a 24-hour period.
   2. Be off for at least 10 hours between shifts.

b. If you do any test support or test facility activities such as facility readiness, repairs, or maintenance, you shall:

   1. Never work a shift of more than 12 hours in a 24-hour period.
   2. Be off for at least 10 hours between shifts.

c. If you are involved in test team activities that directly support tests, you shall:

   1. Never work a shift of more than 12 hours for continuous testing. Normal and desired shifts are 8 hours.
   2. Have a qualified relief every 4 hours so you can take rest breaks, unless your position allows you to take comfort breaks and have water and food during the test.
   3. Be off for at least 10 hours between shifts.

d. If you are involved with hypobaric chamber activities, you shall:

   1. Be off for at least 24 hours before the test starts if you work 12-hour shifts during the pretest phase.
   2. Never start a test if the combined pretest hours worked and the test hours scheduled to complete the test will exceed 12 hours. You may use a fresh test team to staff the duty stations of those whose shifts will exceed 12 hours.
   3. Never work more than five 12-hour shifts in a week without a day of rest right after the 60-hour workweek.
   4. Never work more than 8 hours in a 24-hour period at altitude as an inside lock observer. A standard shift at altitude is 4 hours with a maximum of 6 hours. The medical monitor is responsible for monitoring lock observers for excessive fatigue.

e. Have waivers to the requirements in subparagraph a above approved by the Division Chief responsible for the facility.

f. Have waivers to the requirements in subparagraphs b and c above approved by the director or assistant director responsible for the facility. The request shall include, as needed, the rationale for the waiver, the reason you can't fully comply, alternatives, program impact, hazard assessment, and an assessment by the Space and Life Sciences Directorate. Send a copy of the approved waiver to the Safety and Mission Assurance Directorate.

Hot Work Requirements

9. Requirements for "hot work"

"Hot work" is any work involving burning, welding, or similar operations that is capable of initiating fires or explosions. To do any hot work on cooling towers, anechoic chambers, or mockup areas, first get approval from the Safety and Test Operations Division. Send that office a written statement justifying the need for the work for review and approval. You shall follow these requirements for any hot work:

a. Never do any hot work outside of a designated hot work area without an approved hot work permit. See subparagraph 12.b of this chapter for more information on permits. See paragraph 11 below for information on designated hot work areas.

b. To reduce the chance of a fire, notify the facility fire wardens and remove ordinary combustibles.

c. Post a fire watch to recognize fire hazards, notify appropriate responsible persons in the event of an emergency, start an orderly emergency evacuation when appropriate, and safely use a small portable fire extinguisher. The fire watch shall:

   1. Take appropriate action if potential fire hazards are observed. This includes notifying responsible persons of the observed hazards.

   2. Prevent fires from occurring. For example, be aware of where falling sparks may land and prevent them from falling into any sewer system or onto combustible materials. Maintain adequate clearance between ignition sources and combustible materials.

   3. Maintain a close watch on any locations where hot work has been done to make sure there are no imbedded hot spots or flare-ups.

   4. Notify the Emergency Operations Center (x33333) and building occupants of a fire and start an evacuation.

   5. Extinguish small fires if it can be done safely.

10. Permit-required hot work areas

A permit-required area is an area that is made fire-safe by removing or protecting combustibles from ignition sources. A hot work permit is required for any hot work. See subparagraph 12.b of this chapter for more information. The Safety and Test Operations Division and the Clinical Services Branch shall review permit-required hot work areas during each annual safety, health, and fire protection inspection.

11. Designated hot work areas

A designated hot work area is a permanent location that is approved for hot work operations that will be done regularly. To set up a designated hot work area, you shall:

a. Form a team to review the area. The review includes an on-site survey of the area and a meeting to discuss any discrepancies or concerns. The team shall consist of the following individuals as a minimum:

   1. Safety and Test Operations Division representative.
   2. Clinical Services Branch representative.
   3. Fire Protection engineer.
   4. Facility Manager.
   5. Contractor Safety Representative for contractor operations.
   6. Line manager(s) over the proposed area.

b. Meet the following requirements:

   1. The area shall be a specific area designed or approved for hot work, such as a maintenance shop or a detached outside location.
   2. The structure shall be made of noncombustible or fire-resistive materials, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas.
   3. Chapters 5.1, “Fire safety,” and 8.4, “Welding, cutting, and brazing safely,” of this Handbook.
   4. NASA-STD-8719.11, “Safety Standard for Fire Protection.”
   5. National Fire Protection Association Standard 1, “National Fire Prevention Code.”
   6. National Fire Protection Association Standard 51B, “Standard for Fire Prevention During Welding, Cutting and Other Hot Work.”

c. Submit a plan to the team in subparagraph a above. The plan shall include, as a minimum:

   1. A description of the process and related activities planned.
   2. Location and floor plan, indicating the location of extinguishers, pull stations, phones,

emergency egress routes, nearest flammable and combustible materials, etc.

3. The type of fire alarm and suppression systems in the area.
4. A list of any associated hazards and controls.
5. A hazard analysis for the planned activities.
6. A Job Safety Analysis for the planned activities.
7. An Emergency Evacuation Plan.
8. An air quality survey.
9. A list of responsible individuals and contacts.

d. Attach a signature page to the plan that shall include concurrence signatures of the review team members (subparagraph a above) once their concerns have been identified and addressed.

e. Present the plan, with concurrences noted on signature page, to the JSC Authority Having Jurisdiction or the Chief, Safety and Test Operations Division, or both for final approval.

f. Keep one copy conspicuously posted in the designated hot work area and provide another to the JSC Fire Specialists.

g. Reevaluate the area yearly.

Permits and procedures

12. Permits for hazardous operations

You need to have a permit for certain hazardous operations before you may begin work. Fill out the permit form and post the completed permit at the job site until the job is over. Some operations, such as welding in a confined space, require two or more permits. Permits are only good for a limited time, such as one shift, and expire on the date and time shown on the permit. You shall have one of the following permits as required and post it at the job site along with any procedures you will use:

a. A ***confined space entry permit*** any time you enter a confined space. See Chapter 6.10, "Entering confined spaces," for more details.

b. A ***hot work permit*** any time you do any work involving burning, welding, or similar operations that is capable of initiating fires or explosions outside a designated hot work area. Use JSC Form 1475, "Hot Work-Welding-Cutting Permit," Appendix 5A. Electric soldering irons, hot plates, coffee pots, and similar appliances don't require a permit. Hot work permits are valid for no longer than 1 week. The flowchart in figure 5.8-1 describes the steps to complete a hot work permit.

NOTE: As a fire warden, contractor safety representative, safety point of contact, or facility manager, you shall contact the Clinical Services Branch if you suspect any

exposure or health issue with the hot work.

c. A ***hazardous operations permit*** for other operations as required by paragraphs 4 and 5 of this chapter. Use JSC Form 8, "Hazardous Operation Permit," Appendix 5A. The flowchart in figure 5.8-2 describes the steps necessary to complete and approve a hazardous operations permit.

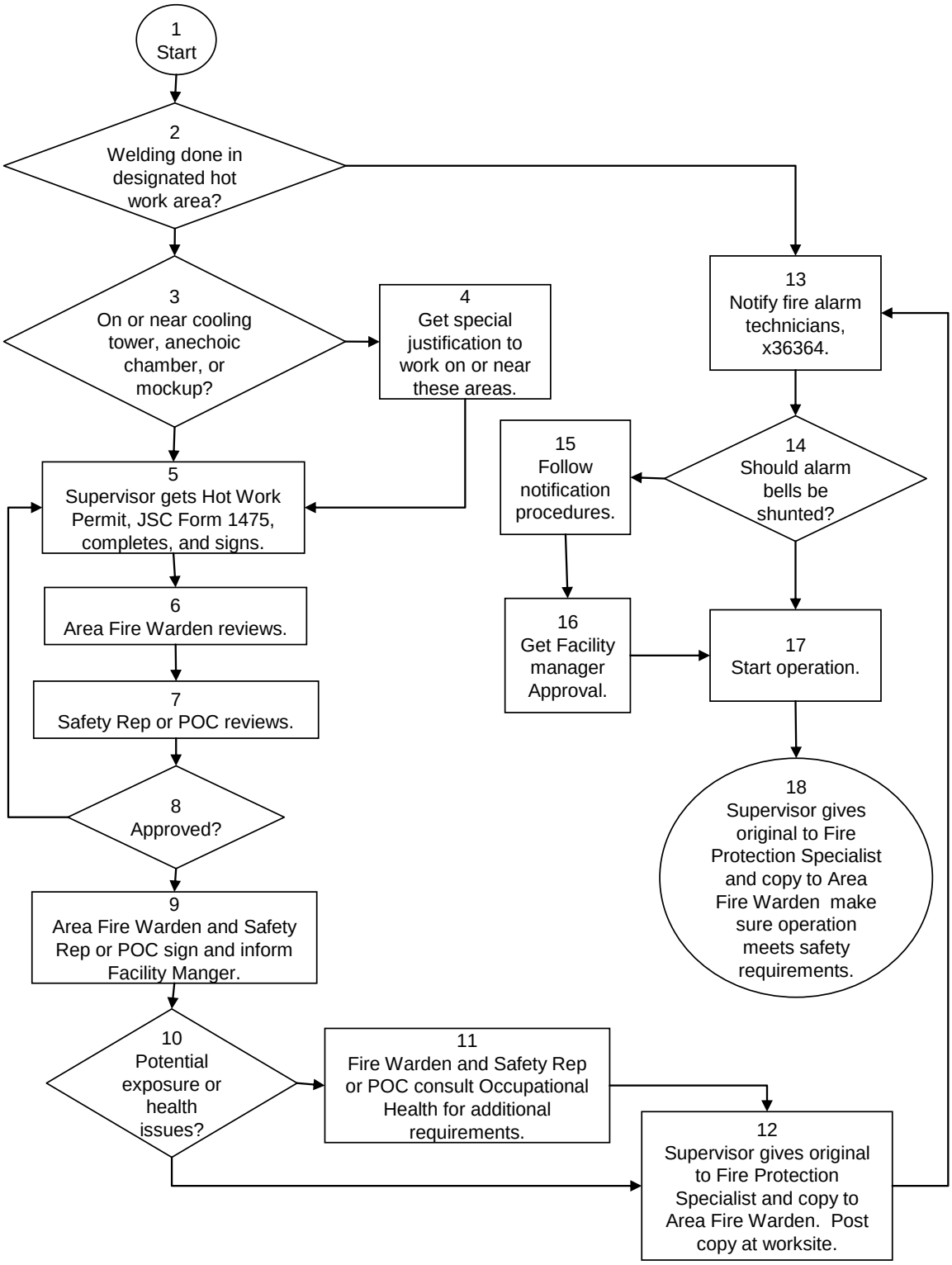

Figure 5.8-1, Hot work permit flow chart

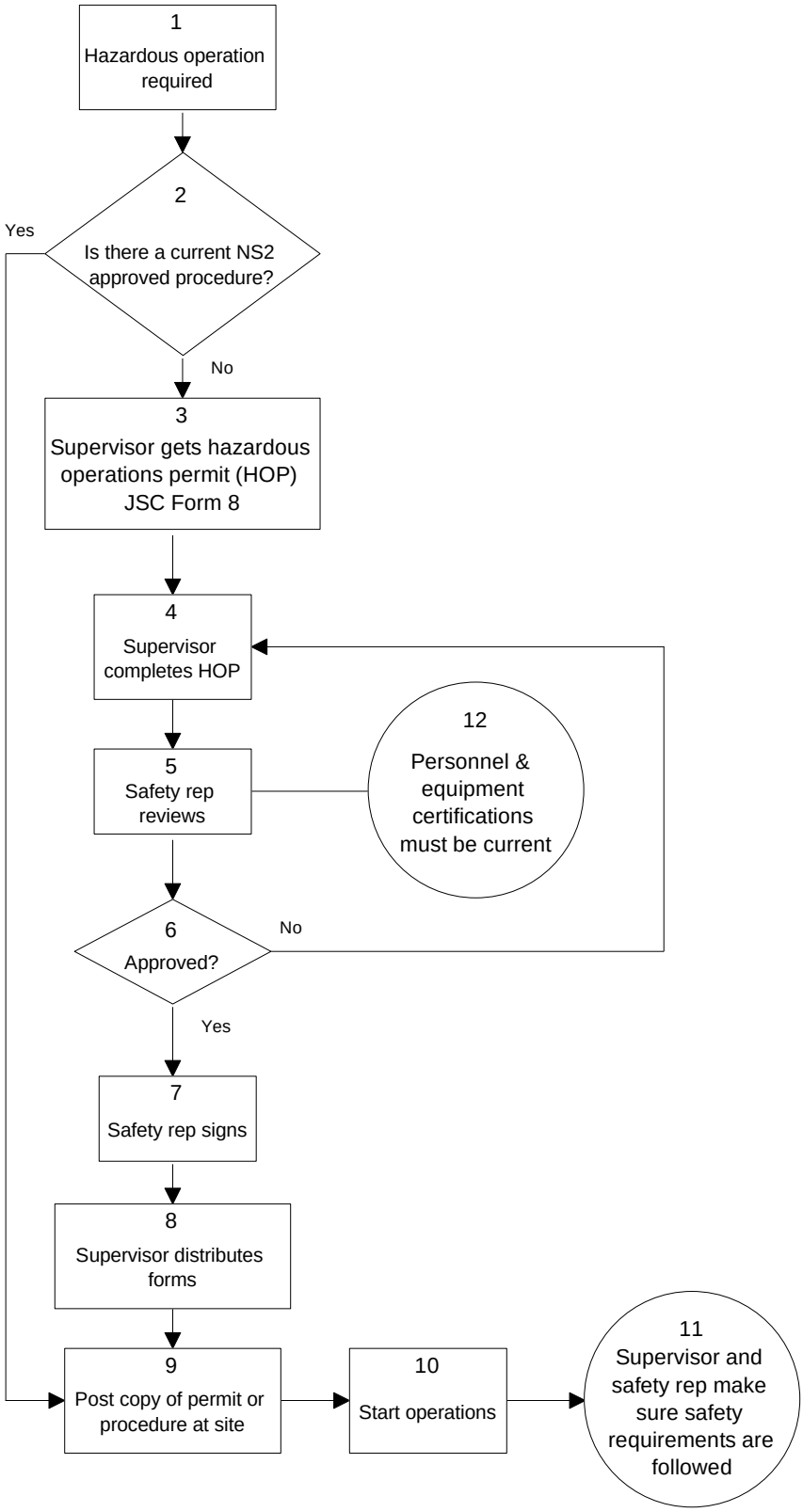

Figure 5.8-2. Hazardous operations permit flowchart.

13. Exceptions to permit requirements

You don't need a hazardous operations permit if you write a detailed procedure and have it approved by the Safety and Test Operations Division. The procedure shall include a statement that says, "This document contains hazardous operations." Confined space entry and hot work permits are always required. To use a procedure, you shall:

a. Include the title and telephone extension of each person who would normally receive a copy of the permit with the procedure.

b. Include enough detail to identify residual hazards and cautions to personnel. This includes necessary tools, safe work practices, personal protective equipment, and worker qualifications. Use a job hazard analysis to identify hazards and controls.

c. Include equipment diagrams to clarify the equipment configurations.

d. Conspicuously mark the title page with a statement that the document contains hazardous procedures and strict adherence is necessary for safety and health.

e. Contact those you listed under subparagraph a above to let them know about your work before you start.

f. Post a copy of the procedure at the job site as you would post a permit.

g. Send any revisions to the procedure to the Safety and Test Operations Division for review and approval.

h. Review and update the procedures at least yearly.

Certification for hazardous operations

14. Certification process

To be certified, you need to show that you have the necessary knowledge, skills, judgment, and physical ability to do the job safely. JSC will provide and document your training and certification. Certification shall follow these requirements:

a. You shall be certified by your management after you:

   1. Complete the necessary formal or on-the-job training. Your management shall at least outline the on-the-job training you need to have and state the minimum number of hours required. Training shall include applicable requirements from 29 CFR 1910, "Occupational Safety and Health Standards," 29 CFR 1926, "Safety and Health Regulations for Construction," and applicable NASA and JSC requirements.

   2. Pass a written test.

   3. Get a certification card when the certification examiner determines that you have the required safety knowledge and skills. The certification examiner and certifying officer shall both sign the card. You may use JSC Form 353, Appendix 5A. Electronic systems that provide on-the-spot verification are also acceptable. See NPR

8715.3, "NASA General Safety Program Requirements," Chapter 7, "Safety Training and Personnel Certification," for more information.

b. Your organization shall keep a record of your certification on JSC Form 209, "Application and Record of Qualification for Personnel Certification," Appendix 5A, or a form or database that contains the same information.

c. Certification examiners shall:

   1. Know the requirements of the operation that they will certify.
   2. Be at least one organizational level higher than the employee to be certified.
   3. Be appointed by the Center Director or his or her designated representative to certify Category I operations.
   4. Be appointed by a directorate-level official or representative from the organization responsible for the operations to certify Category II or III operations.

d. Certification is good for 3 years or less if necessary. The certifying officer and your management may request that you be recertified or retested:

   1. Any time they question your knowledge or skills.
   2. When you have to do any new hazardous operation.

e. You shall have a physical examination when required by paragraphs 4 or 5 of this chapter or by the Clinical Services Branch to be certified or recertified.

15. Exceptions to the requirements in paragraph 14 above

Certifications for operations other than the categories of hazardous operations mentioned in this chapter are exempt from the requirements of this chapter.

16. How you could lose your certification

You will lose your certification if you:

a. Leave JSC or your company.

b. Fail the recertification exam or fail to retain the required knowledge and skills.

c. Are transferred or reassigned and no longer do the operations you are certified for.

d. Fail to pass a required medical examination.

e. Are past your recertification date.

Other requirements and responsibilities

17. Hazardous duty pay

Never use anything in this chapter to justify hazardous duty payments, environmental differential pay, or premium pay. Jobs that qualify for hazardous duty pay aren't necessarily covered by this chapter. See part 5, subpart 6 of the JSC Personnel Manual for information on hazardous duty pay.

18. For more information on hazardous operations

You can find more information on hazardous operations in these documents:

a. 29 CFR 1910.38, "Employee Emergency Plans and Fire Protection Plans"

b. NPR 8715.3, Chapter 3.

19. Responsibilities for hazardous operations

a. As a ***supervisor***, you are responsible for:

1. Getting, completing, and distributing required permits.
2. Monitoring hazardous operations to make sure that the requirements on the permit and in this chapter are followed for any hazardous operation.
3. Providing detailed safety instructions for safe operations to employees who are authorized access to hazardous areas or who do hazardous operations.
4. Identifying operations that could be hazardous. Analyze these operations to determine the risk to personnel, equipment, and facilities.

b. As a ***line manager,*** you are responsible for:

1. Making sure that hazardous operations that require certification are done only by employees with a valid certification.
2. Managing a training and certification program for your organization. This includes providing all training and testing necessary to qualify your employees and certifying them after they show that they have the necessary knowledge and skills.
3. Keeping a master list of: all operations that require certified personnel, employees that are certified for those operations, certification examiners, and certification officers in your organization.
4. Keeping completed certificates and supporting records current. Protect employee training records under NPD 1382.17 (current version), "Privacy Act – Internal NASA Direction in Furtherance of NASA Regulation."
5. Recommending candidates for certification examiners.

c. As a ***safety representative, competent person,*** or ***certified confined space supervisor***, you are responsible for reviewing each permit to make sure that the requirements are

followed and that personnel listed on permits have valid and current certifications if required.

d. As a ***contracting officer***, you are responsible for making sure contracts contain hazardous operations requirement as necessary.

e. The ***Safety and Test Operations Division*** is responsible for:

1. Reviewing all operations being done at JSC or JSC field sites yearly to identify those that could be hazardous. Employee safety and health committees and employee representatives will help identify hazardous operations as requested.

2. Monitoring JSC operations to make sure that only certified personnel are assigned to the tasks described in this chapter.

3. Surveying selected areas to determine the effectiveness of the certification program.

4. Keeping metrics on the waivers and mishaps related to the waivers.

f. The ***Clinical Services Branch*** is responsible for setting requirements for hazardous operations involving potential health hazards, sampling and monitoring environmental conditions, and providing professional medical support and surveillance as needed.

g. The ***Employee Development Branch*** is responsible for providing training courses for hazardous operations as requested by line management and the Safety and Test Operations Division. These courses shall qualify personnel for certification.

Chapter 5.10
Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillator (AED) Program

This could be you . . .

An employee began having chest pain shortly after coming to work. Minutes later, he collapsed on the floor. A fast acting employee called 33333 and shouted for help. After evaluating the patient and starting CPR another employee responded with an AED unit and was able to shock the heart into a normal rhythm.

1. Who must follow this chapter

You shall follow this chapter if you work at JSC or a JSC field site.

2. What this chapter covers

This chapter defines JSC's Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillator (AED) program including training, maintenance, certification, auditing and placement. JSC is committed to improving the chances of survival for any employee or visitor that may suffer from sudden cardiac arrest.

3. Why CPR and AED's are important

JSC shall follow the guidelines of the American Heart Association (AHA) for Public Access to Defibrillation and JSC is committed to providing AED capability within 5 minutes to all locations at JSC. This is accomplished by a combination of Ambulance and Fire Protection Specialists emergency responders and placement of AEDs in facilities across JSC.

Note: Each year, at least 250,000 Americans die of sudden cardiac arrest before they reach the hospital. Sudden cardiac arrest strikes people of all ages and all degrees of fitness usually without warning. Many of these lives can be saved if bystanders quickly phone the JSC emergency numbers (x33333 onsite or 911 offsite), begin CPR and use an AED. Figure 5.10-1 illustrates the coordinated set of actions to improve survival.

Figure 5.10-1: American Heart Association Chain of Survival

4. Elements of a complete AED/CPR program

JSC's AED/CPR program shall include these five program elements:

a. ***Management Support***: Agreement about the goals, responsibility, implementation requirements and costs of the program.

b. ***Employee Participation:*** Demonstrated by recognizing the signs and symptoms of a heart attack, knowing the chain of survival and volunteering to be a CPR/AED lay responder.

c. ***Emergency Responders***: Designated fire protection specialists, health care professionals and others whose primary duty is emergency response.

d. ***Training***: Managers, supervisors, and employees in the CPR/AED program knowledgeable in their role.

e. ***AED Placement***: Assessing the proper number and placement of AED's and supplies.

5. Involvement in JSC's CPR and AED program

The following individuals shall be involved in JSC's CPR and AED program:

a. If you are a ***manager***, you must be committed to maintaining the AED equipment provided as part of your commitment to maintaining a safe and healthful workplace. You shall:

   1. Assign a person to maintain the AED and associated equipment located in your facility. Nominally this person should be the primary or alternate facility manager.

   2. Ensure that your facility Emergency Action Plan includes the cardiac chain of survival and the location of any AED's in the building.

b. If your job ***requires*** you to be certified in CPR or AED operation (e.g., Physician, Nurse, Paramedic, Fire Protection Specialist, Childcare Worker, Electricians) you shall maintain training and certification through the AHA, American Red Cross (ARC), or National Safety Council (NSC).

c. If you are an ***employee*** at JSC, your participation is needed to make the CPR/AED program a success. You may participate by:

1. Learning the risk factors and take steps to prevent cardiovascular disease.
2. Learning the signs and symptoms of heart attacks and immediately call the emergency numbers if you or a co-worker experience heart attack symptoms.
3. Volunteering to be a lay rescuer by learning CPR and how to use an AED.

6. Who may perform CPR and use an AED

To perform CPR or use an AED, you shall have a current certification by the AHA, ARC or NSC.

7. Placement of AED's

JSC has an established AED program. You can find details about the AED program including locations at: http://sd.jsc.nasa.gov/omoh/scripts/HumanTestSupport.aspx. The Clinical Services Branch will decide future placement of AED's and placement shall consider the following criteria:

a. Are more than 200 employees assigned to the building during normal working hours?

b. Do workers engage in activities that increase risk (on second or third shift when the JSC Clinic is closed, e.g. exercise facilities, electrical, machine shops, printing, etc.?

c. Is the facility remote from the JSC Clinic or JSC Emergency Responders such as Ellington Field or the Sonny Carter Training Facility?

d. Is this a multi-story building or a building with a configuration that may slow the Fire Protection Specialist or Emergency Medical Technician response?

8. CPR and AED Training Program

JSC offers free CPR and AED training with sign-up through SATERN. In the course catalog, search for "CPR/AED (ADULT) WITH OPTIONAL CHILD/INFANT CPR MODULE" or "CPR/AED ADULT" Both classes provide JSC workers with AHA certification in Adult CPR/AED. The first class has an optional child/infant CPR component.. The training combines lecture, video demonstrations, take-home manuals, and hands-on manikin training and also includes a description of AED's located throughout JSC. Classes are small in size and fill quickly so it is important you attend on the scheduled day.

The AHA, ARC, and NSC require training every two years to keep your card current.

Facility managers or their designees shall be trained to perform the maintenance check by the Clinical Services Branch.

10. Responsibilities for the JSC CPR and AED program

The following have responsibilities in the JSC CPR and AED program:

a. The Clinical Services Branch has overall responsibility for the formal CPR/AED program. Clinical Services shall:
   1. Assign the AED Program Coordinator
   2. Develop operational protocols and procedures to be included in the JSC Emergency Preparedness Plan.
   3. Assist other organizations in developing specific programs
   4. Train employees.
   5. Review and approve/reject requests for AED's
   6. Audit AED maintenance, record discrepancies in HATS.

b. Facility Manager's or their designees are responsible for maintaining the AED's in cooperation with the Clinical Services Branch and shall:
   1. Inspect the AED and accessory bag weekly. Record the results of the inspection on the sheet provided.
   2. Report discrepancies to the JSC AED coordinator at the number listed on the AED. The number is x25724 or x25728.
   3. Detailed instructions on AED maintenance, inventory and blank inspection sheets are found in the JWI 1040.12, JSC Emergency Preparedness Plan, Annex H.

11. Legal concerns

Most states including Texas have passed " Good Samaritan Laws" to protect those who, in good faith, administer emergency care including using an AED at the scene of an emergency from liability in civil damages unless you are willfully or wantonly negligent. This is covered in greater detail in the CPR and AED class.

13. What if happens if you actually perform CPR or use an AED

Following the administration of CPR and/or the use of an AED, the AED physician director shall review the incident with you. This review is intended to provide feedback to improve our program if necessary. Additionally, you will be offered an opportunity to schedule a stress debriefing with the Employee Assistance Office to discuss the event, patient outcome and receive information on post-incident reaction management.

15. For more information on CPR and AED's

You can find more information about CPR and AED's at:

a. Human Test Support Group: http://sd.jsc.nasa.gov/omoh/scripts/HumanTestSupport.aspx

b. American Heart Association: www.americanheart.org

c. American Red Cross: http://www.redcross.org/services/hss/courses/

Chapter 6.4
Food Safety

This could be you . . .

A food employee didn't wash his hands after using the restroom and then prepared food for the salad bar and contaminated it. Six percent of the staff members became ill with acute dysentery with symptoms including chills, fever, abdominal cramps, and the abrupt onset of profuse watery or bloody diarrhea. Twenty-four individuals required hospitalization for intravenous hydration. The duration of illness for most persons ranged from 3 to 8 days.

1. Applicability of this chapter

You are required to follow this chapter if you handle, store, or transfer food as a part of your job.

2. What this chapter covers

This chapter describes the basic methods for you to use in preventing food-borne illness. Food served at JSC shall be clean, wholesome, free from germs or other toxins, and meet consumer expectations. It applies to transporting, storing, preparing, serving, vending, and inspecting food. This chapter meets the provisions in the following:

a. United States Department of Health and Human Services, U.S. Food and Drug Administration (FDA), Center for Food Safety and Applied Nutrition (CFSAN) publications titled "Food Code" and "Managing Food Safety: A Manual for the Voluntary Use of HACCP [Hazard Analysis and Critical Control Point] Principles for Operators of Food Service and Retail Establishments."

b. Texas Food Establishment Rules and other applicable regulations of the Texas Department of State Health Services (DSHS).

c. Food Ordinance of the City of Houston.

d. NPR 1800.1, Chapter 4.10

3. Hazard Analysis Critical Control Points

HACCP is a prevention-based food safety management system that identifies and monitors specific food safety hazards that can adversely affect the safety of food products. All food prepared on site shall follow an HACCP or equivalent management system that includes and implements a process of self-inspection and continuous improvement.

4. Certifications and employment conditions for food service

To be certified to serve food, you shall:

a. Have an initial medical examination within 30 days of employment and annual examinations thereafter (JSC Form 270). See Chapter 3.6, "Occupational Healthcare Program," of this handbook for more details. This applies to anyone involved in preparing or serving food and beverages. The JSC Clinic will give you the examination and a health certificate card (JSC Form 1169). The health certificate card shall be on file for inspection purposes.

b. Never work with or around food or food preparation areas if you:

   1. Are affected with a disease in a communicable form or are a carrier of a disease.
   2. Are afflicted with boils.
   3. Have infected wounds.
   4. Have an acute respiratory infection.

5. Who to coordinate with for food service concerns

This table tells you whom to contact for certain food service concerns:

For . . .	***Coordinate with the . . .***
Scheduling and performing food service inspections or investigating food-related complaints	Occupational Health Department (281) 483-6726
Scheduling medical examinations	JSC Occupational Medicine Clinic (281) 483-4111
Ensuring compliance with requirements	Exchange Operations Manager

6. Other rules to follow or know about

You shall follow these rules when handling food:

a. Never remove or alter hold orders, notices, or tags placed on food by the health authorities. Re-labeling, repacking, reprocessing, altering, disposing of, or destroying this food is also forbidden without permission. You may put food that is on hold or has a tag on it from the health authorities in suitable storage for holding.

b. Thoroughly wash your hands and arms with soap and warm water:

   1. Before starting work.
   2. During work hours, as often as necessary, to remove soil and contamination.
   3. After using the toilet room.
   4. After using tobacco products, applying cosmetics, and eating.

7. How to protect food

This section is not all-inclusive but highlights key food safety techniques. To prevent food-borne illnesses, you shall:

a. Protect all food being stored, prepared, displayed, served, sold, or transported between activities from contamination including dust, flies, rodents and other vermin, unclean utensils and work surfaces, unnecessary handling, coughs, sneezes, and flooding.

b. Provide conveniently located refrigeration facilities, hot food storage and display facilities, and effective insulated facilities as needed to make sure all food is kept at required temperatures during storage, preparation, display, and service. Keep all cold food at temperatures below 40°F and keep all hot food at temperatures above 140°F. All dated food items should be within designated shelf life. Remove outdated food items.

c. Protect unwrapped food placed on display from contamination from customers and other sources. Use effective, easily cleaned, counter-protective devices, cabinets, display cases, containers, or other kinds of protective equipment.

d. Design and arrange self-service openings in counter guards to protect food from contact by customers.

e. Keep all garbage and rubbish that contains food waste in plastic bags that are in containers of durable metal or other approved materials that don't leak and don't absorb liquids.

f. Dispose of all garbage and rubbish daily in a manner so as to prevent a nuisance. The Clinical services Branch may approve other frequencies for disposing of garbage or rubbish.

g. Take effective control measures to keep rodents, flies, roaches, or other vermin from entering or breeding in any food service or preparation areas. All buildings shall be effectively vermin-proofed, free of vermin, and kept in a vermin-proof and vermin-free condition.

h. Prevent flies and other flying insects from entering through windows, door, skylights, intake openings, or exhaust openings. Use any effective methods such as the following:

   1. Self-closing doors that open outwards
   2. Closed windows
   3. Screens
   4. Controlled air currents

i. Keep the entire food service facility and all areas used for food service or preparation neat, clean, and free of litter, refuse, and garbage.

j. Keep all refrigerators used for food storage clean at all times.

8. Vending machines

All food offered for sale through vending machines shall be:

a. Made, processed, and prepared in facilities that follow applicable federal, state, and local laws and regulations.

b. Stored or packaged in clean, protective containers and be handled, transported, and vended in a sanitary manner.

9. Bottled Water Dispensers

Use only bottled water approved by the Clinical services Branch in bottled water dispensers. Never refill empty bottles yourself. Only the processor is allowed to refill bottles. All organizations using bottled water shall ensure that:

a. No bottles of water or bottled water dispensers are located or stored in areas where general hazards or contamination of any kind poses a threat to users under normal operations.

b. Contractors and subcontractors furnishing bottled water provide routine chemical and microbiological laboratory analysis reports for bottled water delivered to the Center.

c. Bottled water dispensers are maintained in a sanitary condition.

d. All dispensers have equipment numbers.

e. There is prompt recall of the suspect bottled water or other appropriate action when notified of contamination.

10. Protective clothing required for food service

You shall wear:

a. Gloves when:

   1. You do multiple tasks such as handling money and preparing sandwiches.

   2. Frequent hand washing is not feasible.

b. Reasonably clean outer garments if you handle food or food-contact surfaces, or wash dishes.

c. A hair restraint if you prepare or serve food. The restraint shall completely cover your hair to keep hair from food and food-contact surfaces.

11. Food requirements you should be aware of

As an employee of the NASA Exchange or as a concessionaire, you shall:

a. Follow applicable federal, state, and local laws and NASA Procedural Requirements and regulations.

b. Protect food from contamination and spoilage while handling, packaging, storing, or transporting it.

c. Make sure that the food that you serve is:

1. Free from spoilage.
2. Free from contamination.
3. Free from misbranding.
4. Protected from contamination while preparing, displaying or serving it. You shall also protect food that you are moving from one activity to another.

12. Inspections and food concerns

The Occupational Health Department is responsible for inspections and food concerns and will:

a. At a minimum, inspect your food service activities per the following schedule:

1. Buildings 3 and 11 cafeterias, Buildings 1 and 4S snack bars, and Building 207 kitchen are inspected quarterly.
2. Building 211 (Child Care Center) is inspected semiannually in conjunction with the Child Care Center inspection.
3. Vending machines will be inspected in response to complaints .

b. Examine and sample food as often as necessary to detect contamination or misbranding. Food inspectors will also:

1. Place food orders on hold if they are unwholesome or show signs of contamination or misbranding.
2. Place food on hold until a laboratory can examine it.

c. Investigate any reports of suspected food-borne illness from any food service establishment or employee. This may also involve examining the history of any suspected employee. The Occupational Health Department may:

1. Restrict the suspected employee from any food service or vending activities.
2. Close any suspected food service or vending activity until it believes no further danger exists.
3. Restrict the suspected employee to a certain food service or vending area with no danger of transmitting disease.
4. Require medical or laboratory examinations of the suspected employee, other employees, or bodily discharges.

d. Investigate spoiled food products from vending machines. The Occupational Health Department will work with the Exchange Operations to correct problems.

13. Other references

You can find more information on food safety in the following references:

a. Diagnosis and Management of Food-borne Illnesses, A Primer for Physicians and Other Health Care Professionals, and Introduction and Clinical Considerations. Web site: http://www.ama-assn.org/ama1/pub/upload/mm/36/2004_food_introclin.pdf.

b. HACCP-Based Standard Operating Procedures (SOPs). Web site: http://sop.nfsmi.org/HACCPBasedSOPs.php.

c. Hand Hygiene in Retail & Food Service Establishments. Web site: http://www.cfsan.fda.gov/~comm/handhyg.html.

d. Managing Food Safety: A Manual for the Voluntary Use of HACCP Principles for Operators of Food Service and Retail Establishments. Web site: http://www.cfsan.fda.gov/~dms/hret2toc.html.

e. Managing Food Safety: A Regulator' s Manual for Applying HACCP Principles to Risk-based Retail and Food Service Inspections and Evaluating Voluntary Food Safety Management Systems. Web site: http://www.cfsan.fda.gov/~dms/hret3toc.html.

f. The Bad Bug Book. Web site: http://www.cfsan.fda.gov/~mow/intro.html.

g. U.S. Department of Health and Human Services, Public Health Service, Food and Drug Administration, FDA Food Code, with changes (most recent edition). Web site: http://www.cfsan.fda.gov/~dms/foodcode.html.

h. U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, Managing Food Safety: A Manual for the Voluntary Use of HACCP Principles for Operators of Food Service and Retail Establishments (July 2005). Web site: http://www.cfsan.fda.gov/~dms/hret2toc.html.

Chapter 6.7
JSC's policy for handling new or unique hardware or materials

This could be you . . .

A foreign mock-up fell from a crane because it wasn't properly rigged. All of the rigging equipment used was foreign. There was no policy to ensure that the Americans understood the foreign hardware or would handle it properly.

1. Applicability of this chapter

You are required to follow this chapter if you are:

a. A line manager at any level and your organization handles new or unique items as defined in paragraph 2 below.

b. Appointed to oversee any operations involving new or unique items. Paragraph 8 of this chapter lists your responsibilities.

2. New or unique items that this chapter covers

For this chapter, new or unique items are defined as any systems, components, materials, or substances that are unfamiliar to your organization. They can be spaceflight or institutional items. They can come from any foreign country, any U. S. company or organization, or any JSC organization. New or unique items include:

a. Unfamiliar hardware or systems that will require material handling operations or that your organization will test, evaluate, modify, or repair.

b. Unfamiliar substances or materials that your organization will use to make hardware or use in its processes.

3. Process for handling new or unique items

If your organization handles any new or unique items, you shall have a written process that describes how your organization handles these items. You may tailor your process to apply to the types of items your organization handles. The Safety and Test Operations Division and Clinical services Branch can help you if needed. The process shall address the following or document why they don't apply to the type of items your organization handles:

a. Identify what documentation needs to accompany new or unique items that are delivered to your organization. It should address how you handle the documents and where you

keep them. English translations are necessary for foreign items. Such documentation should include the following, as necessary:

1. Drawings of the items.
2. Procedures for handling, operating, or maintaining the items to include the use of hazardous materials and chemicals.
3. Hazard analyses of the items, processes, and materials and recommendations for control of hazards (such as engineering solutions and PPE).
4. A list of changes to items that you may have used previously.

b. Identify what your organization requires for shipping and receiving the items. This should include the following, as necessary:

1. Shipping manifests.
2. MSDSs on any hazardous materials.
3. A list of hazardous materials and their quantities.
4. Schedules for shipping and receiving the items.
5. A list of items that don't comply with U.S. law (DOT, OSHA, and EPA), NASA requirements, or JSC requirements. You shall also decide how to meet those requirements or request variances.
6. Specifications for containers and packing.
7. A list of personnel designated to receive the items.
8. Export authorizations.

c. Define how your organization accepts new or unique items. This should include, as necessary:

1. A list of personnel authorized to accept the items.
2. What inspections or reviews you do before accepting the items. A series of readiness reviews, appropriate to the risk, is recommended to ensure the new hardware or equipment will be handled properly and safely during the process. These could be pre-receipt review, pre-handling review, pre-installation review, a pre-process review, etc. Reviews known by other names, such as a critical lift review or test readiness reviews can be modified to fit the need. The reviews should be documented and retained in the organizations files. If the new equipment is to be incorporated into the facilities or existing test systems a pre-use analysis per chapter 2.3 is required.
3. What criteria you use to determine whether the items are acceptable.
4. How you track the items while they are with your organization.

d. Identify any special storage and handling requirements, such as:

1. Lifting requirements.
2. Environmental and security restrictions during storage.

3. Limited life considerations.
4. Any other safety and health precautions.

e. Define how you report problems with the items and whom you report them to. Such problems may include:
   1. Nonconformances with any applicable requirements.
   2. Mishaps that occur during handling, test, or training.
   3. Damage to the items.

f. Define how you train or certify anyone involved with handling the items, such as:
   1. Material and hardware handlers.
   2. Test team members.
   3. Flight crews.

g. Define how you handle any excess items and byproducts, such as:
   1. Hazardous wastes.
   2. Unused hazardous materials.
   3. Recyclable materials.

h. Define how you resupply any consumables used in processing the items such as batteries, oxygen, and fuel.

i. Define how you inform management of the risks of handling the items.

j. Assign persons to be responsible for the applicable issues. (always required)

k. Include responsible line manager signature approval at the level that oversees all handling. (always required)

NOTE: A checklist is available to help you with your analysis of new or unique hardware at URL: http://www6.jsc.nasa.gov/safety/Checklists/docs/New_Unique_Cklist.docx.

4. Other requirements for handling new or unique items as a line manager

If your organization handles any new or unique items, you shall:

a. Make sure your employees follow your process when handling new or unique items.

b. Make sure that anyone who handles new or unique items understands the items and their interfaces with JSC equipment.

c. Provide adequate precautions that safeguard both those handling the items and the items themselves.

d. Make sure that all operations involving new or unique items follow JSC, NASA, and other federal requirements that apply (see paragraph 6 of this chapter).

e. Make sure that configuration control is maintained on the items. This should be to a level that is appropriate for the type of items they are (flight, training, etc.).

f. Assign someone at the project level to oversee any handling of new or unique items while the items are with your organization. This person will:

   1. Have primary responsibility for the new or unique items and their interfaces with JSC systems.

   2. Be accountable for all decisions involving the new or unique items.

g. Fulfill the responsibilities listed in paragraph 8 of this chapter.

5. Special precautions for handling foreign items

If you handle new or unique items that are foreign, you shall:

a. Make sure you account for differences between Standard International units of measurement and English units, if necessary. The foreign items will use Standard International units. Your JSC equipment may use English units.

b. Have English translations of all documents that accompany the items.

c. Make sure you understand any cultural differences that may affect how you handle foreign items. Engineering conventions may differ between the U.S. and the country from which the items came.

6. Other requirements to ensure safety while handling new or unique items

Your process and any individual project procedures shall make sure that operations involving new or unique items follow these requirements, if they apply, or request waivers.

For operations involving . . .	***Follow . . .***
General handling	• 29 CFR 1910, "Occupational Safety and Health Standards, General Industry," and 29 CFR 1960, "Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters," (OSHA) • 49 CFR, "Transportation" • 40 CFR, "Protection of Environment" • JPR 1700.1, "JSC Safety and Health Handbook" • JSC 17773, "Preparing Hazard Analysis for JSC Ground Operations"
Lifting the items	• NASA-STD-1740.9, "Standard for Lifting Devices and Equipment" • Chapter 8.5, "Lifting operations and equipment safety," of this handbook
Pressurized systems	• JPR 1710.13, "Design, Inspection, and Certification of Pressure Vessels and Pressurized Systems," (current version)

For operations involving . . .	*Follow . . .*
Human research	• JSC 20483, "JSC Institutional Review Board, Guidelines for Investigators Proposing Human Research for Spaceflight and Related Investigations" • NPD 7100.8, "Protection of Human Research Subjects" • 45 CFR 46, "Protection of Human Research Subjects"
Zero-gravity aircraft	• JSC 22803, "JSC Reduced Gravity Program User's Guide"
Spaceflight	• NSTS 1700.7B, "Safety Policy and Requirements for Payloads Using the Space Transportation System" • NSTS 13830 "Implementation Procedure for NSTS Payloads System Safety Requirements"
Radioactive materials, lasers, and other ionizing and nonionizing radiation devices	• 10 CFR, "U.S. Nuclear Regulatory Commission Rules and Regulations," with particular emphasis on parts 19, 20, 30, 31, and 35 • 29 CFR 1910.97, "Non-Ionizing Radiation" • 29 CFR 1910.1096, "Ionizing Radiation" • Applicable consensus safety and health standards for ionizing and nonionizing radiation exposures • Approvals and guidance from the JSC Radiation Safety Committee and the Radiation Safety Office

7. Responsibilities of an organizational director or program manager for handling new or unique items

If your organization handles any new or unique items, you shall:

a. Develop policies for handling new or unique items within your organization.

b. Make sure processes for handling new or unique items are developed in your organization, as necessary, and are reviewed by safety and health professionals.

c. Designate which level of management needs to approve processes or project procedures for handling new or unique items.

8. Responsibilities for those appointed to oversee handling of new or unique items

If you are appointed to oversee the handling of new or unique items, you are responsible for:

a. Serving as the single point-of-contact for all decisions about the new or unique items and their interfaces with JSC systems.

b. Developing project-specific procedures that follow all safety and health regulations applicable to your specific project.

c. Determining what safety and health regulations apply to your project before you develop any project procedures. The Safety and Test Operations Division and the Clinical services Branch can help you with this.

d. Obtaining signature approval from the appropriate level of management on any project-specific procedures before anyone begins any work on the project.

Chapter 6.10
Entering confined spaces and controlled areas

This could be you . . .

Three technicians died in a confined space that contained nitrogen. The first one passed out and died when he entered the space. The other two passed out and died trying to rescue him.

A technician was working in a chamber that was not a confined space and encountered an oxygen-deficient atmosphere after climbing a ladder to a higher level. The technician lost consciousness and fell from the ladder.

1. Applicability of this chapter

You are required to follow this chapter if you:

a. Do or oversee any work that involves entering confined spaces or controlled areas at JSC.

b. Have a confined space or controlled area in your work areas as a facility manager or line manager.

c. Do any of the above work at WSTF; you are required to follow WSTF procedures and requirements for entering confined spaces or controlled areas and use WSTF forms that meet the intent of this chapter.

2. What this chapter covers

This chapter contains JSC requirements for safely entering confined spaces that meet and exceed those in 29 CFR 1910.146, "Permit-Required Confined Spaces." Paragraphs 28 – 31 cover controlled areas.

Defining and classifying confined spaces

3. What is a confined space?

A confined space is one that meets all of the following criteria:

a. An employee can completely enter and work in the space.

b. The space has limited or restricted entries or exits.

c. The space isn't designed for continuous employee occupancy.

Examples of confined spaces include tanks, vessels, silos, storage bins, hoppers, vaults, pits, and trenches deeper than four feet. Hazards of confined spaces include possible

asphyxiation; explosions; poisoning from toxic vapors; engulfment; slips, trips, and falls; and mechanical and electrocution hazards.

4. Classifying a confined space at JSC

All confined spaces at JSC have entry permit requirements. JSC has two classes of confined spaces: JSC permit-required confined spaces and OSHA permit-required confined spaces. Paragraphs 5 and 6 below define these spaces. The Safety and Test Operations Division, the Clinical Services Branch, and certain line organizations have classified confined spaces using these definitions. The Clinical Services Branch keeps a list of JSC's confined spaces and their normal classifications. Confined space locations and classification may change as facilities and operations change.

The following requirements apply to identifying and classifying confined spaces:

a. JSC and WSTF shall evaluate their work areas to identify and classify confined spaces.

b. You shall classify a confined space based on its normal use. The work to be done in a confined space may change its normal classification.

c. You shall reclassify a JSC permit-required space as an OSHA permit-required confined space if the work to be done increases the hazard in the space. Examples include welding, chemical use, radiography, and painting.

d. You may reclassify an OSHA permit-required confined space as a JSC permit-required confined space if you can eliminate the hazards without entering the confined space. This reclassification is only valid for as long as the hazards remain eliminated for that entry.

5. JSC permit-required confined spaces

A JSC permit-required confined space is a confined space that doesn't contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

6. OSHA permit-required confined spaces

An OSHA permit-required confined space is one that has one or more of the following characteristics. The space:

a. Contains, or has the potential to contain, a hazardous atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self rescue, injury, or acute illness from one or more of the following causes:

   1. Flammable gas, vapor, or mist in excess of 10% of its lower explosive limit (LEL).

   2. Airborne combustible dust at a concentration that meets or exceeds its LEL.

   3. Atmospheric oxygen concentrations below 19.5% or above 23.5%.

4. Atmospheric concentration of any substance for which there is a published PEL and which could result in employee exposure in excess of its dose or PEL.
5. Any other atmospheric condition that is immediately dangerous to life or health.

b. Contains a material that could engulf an entrant.

c. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward or tapers to a smaller cross section.

d. Contains any other recognized serious safety or health hazard.

7. What to do if you have confined spaces in your work area

If you, as a facility manager or line manager, have an OSHA permit-required or a JSC-permit required confined space in your work area, you shall follow these rules:

a. For an OSHA permit-required space, you shall:

1. Inform exposed employees, by posting danger signs or by any equally effective means, of the existence and location of and the danger posed by the OSHA-permit spaces.
2. Lock or bolt the space by a mechanical means.
3. Post or stencil this sign on all entrances if you can't lock or bolt the space (contact Clinical Services Branch at x34317 for signs and stencils):

DANGER CONFINED SPACE, NO ENTRY WITHOUT PROCEDURE AND PERMIT

b. JSC-permit required spaces shall be labeled with the following sign:

DANGER CONFINED SPACE, NO ENTRY WITHOUT PROCEDURE AND PERMIT

Requirements for entering confined spaces

8. Requirements for entering any confined space

Carefully plan and control work in a confined space to prevent death or serious injury. Ideally, you should eliminate the hazards in a confined space before entering it. If you can't eliminate the hazards, control them with PPE or other measures. You shall follow these requirements for entering any confined space:

a. Have the following before you enter any confined space:

1. An approved and posted written procedure as described in paragraph 13 of this chapter.
2. An approved and posted entry permit as described in paragraph 14 of this chapter.

3. Confined space training.

b. Never enter a confined space until you have assessed the hazards, met the requirements in this chapter, and have a permit that authorizes you to enter.

c. Carefully examine any work you will be doing in the space to make sure it doesn't increase hazards. If your work will increase the hazards in a JSC permit-required confined space, you shall upgrade the classification to an OSHA permit-required confined space.

d. Only allow the minimum number of people necessary to do the job in or around a confined space.

e. You may downgrade an OSHA permit-required confined space to a JSC permit-required confined space if you can eliminate the hazards in the space without entering it. You shall document that you have eliminated the hazards on your entry permit. Ventilate the space for 30 minutes before testing the atmosphere. Continue ventilation while people are in the space. See subparagraph 16a of this chapter for more details.

9. Requirements for entering a JSC permit-required confined space

A JSC permit-required confined space is defined in paragraph 5. In addition to the procedure and permit, you shall follow any of these requirements that apply to the space or to the work you will be doing:

a. Follow your current, approved procedure and all conditions on your permit.

b. Use lockout/tagout to isolate any energy sources. See paragraph 17 of this chapter for more details.

c. Eliminate any conditions that make it unsafe to remove any entrance cover before you remove it.

d. Ventilate the space for 30 minutes or as specified in the procedures. Continue ventilation while people are in the space. See subparagraph 16.a of this chapter for more details.

e. Do not enter the space until atmospheric testing shows:

1. Oxygen levels are between 20.5% and 21.5 %.

2. Explosive atmospheres are 0% of the LEL.. (See subparagraphs 16b, 16c, and 16d of this chapter for more details.)

f. Use at least one attendant. See paragraph 19 of this chapter for more details.

g. Restrict access with barriers and tape. See subparagraph 21.f of this chapter for more details.

h. Wear hard hats when required. See paragraph 22 of this chapter for more details.

i. Make sure that you have communications with those in the space and a method to call for emergency services. See subparagraph 21.c of this chapter for more details.

j. Contact the Occupational Health Department at x36726 if you have any questions.

10. Requirements for entering an OSHA permit-required confined space

In addition to having an approved procedure and permit, you shall:

a. Follow your current, approved procedure and all conditions on your permit.

b. Notify the Emergency Operations Center at x34658 and the Occupational Health Department at x36726 that you are entering an OSHA permit-required confined space.

c. Use lockout/tagout to isolate any energy sources. See paragraph 17 of this chapter for more details.

d. Eliminate any conditions that make it unsafe to remove any entrance cover before you remove it.

e. Ventilate the space for 30 minutes before testing the atmosphere. Continue ventilation while people are in the space. See subparagraph 16.a of this chapter for more details.

f. Test for a high- or low-oxygen level, explosive atmosphere, and toxic gas or vapor as specified in the procedure before entering the space. Verify that:

   1. Oxygen levels are between 20.5% and 21.5%.
   2. Explosive atmospheres are 0% of the LEL.
   3. Toxic vapor levels meet the concentration levels specified in the confined space procedure.

   (See subparagraphs 16b, 16c, and 16d of this chapter for more details.)

g. Use the following equipment:

   1. Body harnesses, lifelines, and a hoisting or lifting device. Use wristlets for overhead and small openings. See paragraph 23 of this chapter for more details.
   2. Required PPE, including hard hats. See paragraph 22 of this chapter for more details.
   3. Intrinsically safe lighting and tools. See subparagraphs 17.c and 17.d of this chapter for more details.

h. Have an attendant and entry supervisor present. The supervisor may leave the space if he or she isn't also the attendant. See paragraphs 18 and 19 of this chapter for more details.

i. Restrict access with barriers and tape. See subparagraph 21.f of this chapter for more details.

j. Make sure you have communications with those in the space and a method to call for emergency services. See subparagraph 21.c of this chapter for more details.

11. Requirements for entering a sewer

Sewer lift stations are classified as an OSHA permit-required confined space. Sewer entry differs from other permit entries in that you can rarely completely isolate the space that you will enter. The atmosphere may suddenly become deadly from causes beyond your control. To work in a sewer, you shall follow the requirements in paragraph 10 of this chapter and:

a. Keep in contact with the local weather bureau and fire and emergency services as much as possible. This will help you know whether you should delay your entry into the sewer or cause you to remove people from the sewer if:

   1. Sewer lines might suddenly flood from rain or firefighting activities.
   2. Flammable or other hazardous materials may be released into sewers from industrial or transportation accidents.

b. Never enter a sewer unless you are thoroughly trained in proper sewer entry procedures and the use of atmospheric testing equipment.

c. Monitor the sewer atmosphere before entry and continuously with an instrument that sounds an audible alarm in addition to a visual display. Monitor for all of the following conditions (see subparagraphs 16.b, 16.c, and 16.d of this chapter for more details):

   1. Oxygen level within the range of 20.5% and 21.5%.
   2. Flammable gas or vapor concentrations above 0% of the LEL.
   3. Any detectable hydrogen sulfide and carbon monoxide concentrations.

d. Carry the monitoring instrument at all times while you are in the sewer to warn you of any change in atmospheric conditions. If you are working with others in the same immediate location, the group leader may carry an instrument for the group.

12. Requirements for entering the JSC tunnel system

The JSC tunnel system is normally classified as a JSC permit-required confined space and is continuously ventilated. Atmospheric testing is not normally required in the JSC tunnel system because it is continuously ventilated. To work in the tunnel system, you shall follow the requirements in paragraph 9 of this chapter and:

a. Assess the work you will be doing. If it will create new hazards that require you to upgrade to an OSHA permit-required confined space the zone that you will work in, you shall follow the requirements in paragraph 10 of this chapter.

b. Follow your approved, up-to-date procedure.

c. Fill out and sign a confined space permit to show that you've met safe entry conditions before you enter the tunnel.

d. Verify through the Operations Control Center ((281) 483-2038) that the ventilation fans in the areas that you will be working in are operating.

e. Notify the Operations Control Center ((281) 483-2038) before you enter and when you

leave the tunnel system.

f. Wear hard hats, safety glasses, and industrial shoes (i.e., no soft-sole, open-toe, or canvas-covered shoes).

g. Have a flashlight with you at all times.

h. Read, sign, and follow "Tunnel Safety Awareness" at the Operations Control Center.

i. Use the "buddy system." Don't enter the tunnel system alone.

13. Requirements for entering a trench

Trenches greater than 4 feet deep are confined spaces at JSC. You can find requirements for working in trenches in 29 CFR 1926.650, 1926.651, and 1926.652. Refer to Chapters 5.8 and 10.1 of this handbook for additional requirements for working in trenches and excavations. The following additional requirements apply:

a. An approved procedure and a permit are required as described in paragraph 8 above.

b. Signs and barriers are only required when the trench is unattended

c. Work in trenches may require atmospheric testing when working at depths greater than 4 feet and will require protection from soil collapse when working at depths great than 5 feet.

Precautions for entering confined spaces

14. Procedure required to enter a confined space

Before you enter any confined space, you shall have a current, approved written entry procedure that covers the specific job you will do in the space.

a. Use JSC Form 992, "Confined Space Entry Procedure," (Appendix 6A).

b. The entry procedure shall:

1. Be approved yearly by the Safety and Test Operations Division, the Occupational Health Department, and the contractor safety representative. You may use a procedure several times if its approval is current. If you need to change a procedure, you shall write a new one and have it approved.

2. Be followed as written.

3. Be posted at the entrance so that the entrants can confirm that safe entry conditions have been met.

c. Include MSDSs for any chemicals that you will use in or near the confined space.

15. Permits for entering a confined space

Confined space entry permits document that you have met the safe entry conditions required by the entry procedure before you enter a confined space. You need to have a completed and endorsed entry permit form, JSC Form 1476, "Confined Space Entry Permit," (Appendix 6A) to enter any confined space. Entry permits shall:

a. Document that all safety measures required in the entry procedure are taken before entry. The entry supervisor does this by completing and signing the entry permit form to authorize personnel to enter.

b. Be posted when completed and signed at the entrance so that entrants can confirm that safe entry conditions have been met.

c. Be valid only for the time required to complete the job identified on the permit and only for one working shift. If you need it for a longer time, you shall get approval from the Safety and Test Operations Division and the Occupational Health Department.

d. Include MSDSs for any chemical being used in or near the space.

16. Canceling a permit

As an entry supervisor, you shall follow these requirements to cancel a permit:

a. Cancel if one of the following occurs:

   1. The work covered by the entry permit is done.

   2. A condition arises in or near the space that is not allowed under the permit.

b. All entrants shall leave the space when the permit is canceled.

c. Follow these steps after you cancel the permit:

   1. Note any problems you encountered during the operation on the permit so that JSC can improve its confined space program.

   2. Send a copy of each canceled permit within one week to the Occupational Health Department for a yearly review.

   3. Keep each canceled entry permit for at least 1 year.

17. Controlling atmospheric hazards in a confined space

You shall control atmospheric hazards in a confined space before entering it by following these requirements:

a. Ventilate all confined spaces with clean air for at least 30 minutes or as required by the procedure before testing the atmosphere in the confined space. If the space has permanently installed continuous ventilation that has been running and continues to run, you may enter without the 30-minute waiting period if you have met all other safe entry conditions in the procedure and permit. (In some cases, atmospheric testing may not be

required in continuously ventilated spaces and as approved in the confined space procedure.) You shall follow these requirements for forced-air ventilation:

1. Ventilate the space continuously until the job is done, whether the space is occupied or not.
2. Don't enter the space until the forced-air ventilation has eliminated any hazardous atmosphere without approval from the Safety and Test Operations Division, Occupational Health Department, and your safety representative.
3. Direct the ventilation to the immediate areas where employees are or will be working within the space.
4. Take air from a clean source and make sure that the source won't increase the hazard in the space.

b. Test the atmosphere in the confined space with a calibrated direct-reading instrument from outside the space as required by the procedure. Periodic or continuous testing may also be required while working inside the space. A qualified person shown on the approved entry procedure needs do the initial testing. This person shall be an authorized representative of the Occupational Health Department or an employer-designated confined space entry supervisor. The Safety and Test Operations Division and the Occupational Health Department will decide who will do the testing while reviewing the entry procedure.

   Test for the following conditions **in this order** and record the results on the entry permit form:

   1. Oxygen content.
   2. Flammable gases and vapors.
   3. Potential toxic air contaminants.

c. Confirm that the following acceptable atmospheric conditions exist in the confined space before entry:

   1. An oxygen level between 20.5% and 21.5%.
   2. No positive indication of a combustible, explosive, or toxic gas or vapor.

   If initial testing shows conditions are unacceptable, you shall continue ventilation and retest the atmosphere unless the procedure says otherwise. If the readings continue to be unacceptable, call the Occupational Health Department at x36726 for further air quality testing.

d. Follow these rules while working in the confined space:

   1. Test the atmosphere in the space periodically to make sure that acceptable conditions are being maintained during entry operations. The time period between tests shall be specified on the confined space procedure and entry permit.
   2. Test the atmosphere continuously if you can't isolate the space because it is large or

is part of a continuous system, or the work being done in the space makes continuous testing necessary.

3. A continuously ventilated confined space may not require periodic or continuous atmospheric testing if no chemicals leak into the space or if no hazardous conditions are generated by the work being performed. If you detect a chemical leak or change in conditions in the space, you shall reevaluate the continuously ventilated space and test the atmosphere.
4. Variations from atmospheric conditions as indicated above are acceptable.
5. Record all readings on the permit.

e. Make sure all instruments used to test the atmosphere in a confined space are:

1. Calibrated under the manufacturer's guidelines.
2. Working properly before using them.
3. Labeled with calibration dates and cycles to show that they are within the calibration period.

f. Isolate pipelines that contain flammable, toxic, irritating, or oxygen-displacing gases or vapors, if feasible, to prevent a hazardous atmosphere from forming inside the space while work is being done. Isolate pipelines by:

1. Completely depressurizing and disconnecting possible contaminant supply lines and placing a blank flange on the pipe leading into the confined space.
2. Using two blocking valves with a vent valve open between them.
3. Using other blank, block, and bleed valve configurations that have been previously approved by the Safety and Test Operations Division.

18. Controlling other hazards in a confined space

You need to isolate energy sources to the area you in which you will be working to prevent mishaps such as electrical shock, fire, or injury from moving parts. To do this, you shall:

a. Follow lockout/tagout and isolation requirements in Chapter 8.2, "Lockout/tagout practices," of this handbook to:

1. De-energize electrical or pneumatic equipment within the space.
2. Lock and tag all control devices for fixed equipment in the space. This doesn't include fixed lighting or ventilation equipment, unless you are working on them.

b. Deactivate, shield, or remove all radioactive sources.

c. Safeguard electrical equipment by:

1. Using only properly insulated or grounded portable electrical equipment. Double-insulated electrical hand tools are acceptable. Inspect all electrical before entry.

2. Using ground fault circuit interrupter (GFCI) circuit breakers for all case-grounded, handheld electrical equipment. GFCIs should be 4 to 6 milliamp, where possible. Place them at the power source unless the source is an ungrounded portable generator, an ungrounded battery of less than 28 volts, or an ungrounded isolation transformer of less than 28 volts.
3. Using pneumatic power tools instead of electrical tools when possible. Pneumatic tools shall have conductive air supply hoses. Never use nitrogen or other inert gases to power the tools. Use breathable air to power pneumatic tools.
4. Using cordless, rechargeable portable power tools, with an intrinsically safe rating, when possible. If they are used, they shall have an explosion-proof or intrinsically safe rating for spaces that could contain or develop an explosive atmosphere.
5. Protecting temporary lighting with bulb guards or by recessing the bulbs. Power temporary lighting in locations that are wet or have standing fluids with batteries or low-voltage circuits.
6. Grounding or double-insulating heavy-duty electric cords and all metal housings.

d. Control ignition sources by:

1. Using explosion-proof or intrinsically safe (non-sparking) lighting, ventilation equipment, and tools in potentially flammable atmospheres.
2. Never bringing ignition sources into an OSHA permit-required confined space until tests by a confined space monitor have confirmed that combustible or flammable gases or vapors aren't present in the space. You may work in confined space atmospheres with more than 0%, but never more than 10%, of the LEL if you have previous approval from the Safety and Test Operations Division or the Occupational Health Department.
3. Never using polyethylene and other materials that generate static electricity where explosive atmospheres could exist. Tents erected over or around the space shall be of a conductive material and properly grounded.

People and equipment required for entering confined spaces

19. Duties of entry supervisors

As an ***entry supervisor***, you shall, for each entry:

a. Know the hazards entrants may face in a confined space, including information on the mode, signs or symptoms, and consequences of the hazard exposures.

b. Make required pre-entry notifications, and coordinate all entries with your safety representative.

1. Notify the JSC Emergency Operations Center ((281) 483-4658) and the Occupational

Health Department (x36726) immediately before anyone enters an OSHA permit-required confined space.

2. Notify the area fire warden if you will do hot work before entry. If you are at Ellington Field, notify the Ellington Field fire inspector as well (x49609).

c. Evaluate conditions inside and outside the confined space, including temperature extremes, humidity, noise, and vibration, before entry. Determine what measures are necessary for a safe entry and to make sure that those measures are taken.

d. Get an entry permit and check each entry to make sure of the following before signing the permit and allowing anyone to enter:

1. All required blocks are filled in.
2. All tests specified by the procedure have been conducted.
3. All requirements and equipment specified by the procedure are in place.
4. The approved procedure and permit are posted at the job site and everyone who needs a copy has one.

e. Make sure that all attendants and authorized entrants are properly trained before entry.

f. Make sure that you have all other required permits, such as hot work and hazardous operations permits, before entry.

g. Make sure that oxygen and combustible gas-monitoring devices are available, calibrated, and used for atmospheric testing if required by the entry procedure.

h. Make sure that rescue services are available, you can maintain communications, and communication devices work.

i. Remove unauthorized individuals who enter, or who attempt to enter, the space during operations.

j. If you need to transfer responsibility for the space to another supervisor, make sure that operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained. Evaluate conditions as often as needed by the hazards of operations in the space.

k. Make sure that the method of communication is appropriate for the atmosphere in the space.

l. Remove all workers from the space and cancel the permit when the job is done or when unacceptable conditions have arisen. Provide the Occupational Health Department a copy of the canceled permit.

20. Duties of entry attendants

At least one attendant needs to be in the immediate vicinity outside an OSHA permit-required confined space and other spaces, if the procedure requires, while people are working in the space. As an ***entry attendant*** you shall:

a. Know the hazards entrants may face in a confined space, including information on the mode, signs or symptoms, and consequences of the hazard exposures.

b. Be aware of possible behavioral effects on entrants exposed to hazards.

c. Continuously keep an accurate count of authorized entrants in the space on the entry permit form.

d. Remain outside the permit space during entry operations until relieved by another attendant.

e. Keep in visual or voice contact with authorized entrants as necessary to monitor entrant status. If the personnel in the space need to leave visual contact and verbal contact with the attendants, use mechanical or electronic communications.

f. Monitor activities inside and outside the space to determine whether it is safe for entrants to stay in the space. Order those inside to leave the space immediately if you:

   1. Detect a prohibited condition.
   2. Notice behavioral effects of hazard exposure in someone in the space.
   3. See a situation outside the space that could endanger those inside.
   4. Can't effectively and safely perform all of your required duties.

g. Maintain the method of contacting emergency services as required in the approved procedures.

h. Call emergency rescue services when you see that those inside may need help to escape from hazards in the space.

i. Take the following actions when unauthorized persons (not involved in the entry) approach or enter a permit space while entry is under way:

   1. Warn the unauthorized persons that they need to stay away from the permit space.
   2. Advise the unauthorized persons that they need to exit immediately if they have entered the permit space.
   3. Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.
   4. Stop confined space operations until unauthorized personnel are removed.

j. Perform non-entry rescues, when necessary and feasible, after notifying emergency rescue services. Never enter a confined space to rescue someone unless you are part of an emergency rescue team as described in paragraph 24 of this chapter.

k. Never do anything that might interfere with your primary duty to monitor and protect those inside the space.

21. Duties of authorized entrants

If you are an ***authorized entrant***, you shall:

a. Know the hazards that you may face in a confined space, including information on the mode, signs or symptoms, and consequences of the hazard exposures.

b. Properly use equipment as required by this chapter.

c. Communicate with the attendant as necessary so the attendant can monitor your status and alert you if you need to evacuate the space.

d. Alert the attendant if you:

   1. Recognize any warning sign or symptom of a dangerous situation.

   2. Detect a prohibited condition.

e. Exit from the permit space as quickly as possible if you:

   1. Get an order to evacuate from the attendant or the entry supervisor.

   2. Recognize any warning sign or symptom of a dangerous situation.

   3. Detect a prohibited condition.

   4. Hear an evacuation alarm.

22. Equipment for entering a confined space

You shall have the following equipment before you enter as required by the procedure:

a. Portable ventilating equipment for spaces without permanent mechanical ventilation. You are responsible for providing ventilating equipment.

b. Testing and monitoring equipment for atmospheric testing as indicated on approved entry procedures. You are responsible for providing testing equipment.

c. Communications equipment that is compatible with the atmosphere in the space for communicating with entrants and emergency services.

d. GFCI for all portable electrical equipment.

e. Lighting equipment for safety while working in and exiting the space.

f. Barriers and shields to prevent inadvertent entries into confined spaces while work is in progress. Post the following sign at all open entrances to confined spaces:

CAUTION CONFINED SPACE WORK IN PROGRESS.

NO ENTRY WITHOUT PERMIT AND PROCEDURE.

h. Equipment, such as ladders, needed to safely enter and exit the space.

i. Any other equipment necessary for safe operations in the space.

23. Protective clothing and equipment for entering a confined space

If you enter a confined space, you shall wear PPE as required in the procedure to protect you from hazards in the space:

a. Hard hats to protect you from falling objects or overhead bump hazards.

b. Impervious personal protective clothing if you will work with corrosive or irritating products or toxic chemicals that penetrate the skin.

c. Eye or face protection if your eyes or face could be hurt.

d. Industrial shoes (no soft-sole, open-toe, or canvas-covered shoes).

e. Respiratory protection for hazardous atmospheres. You shall also follow these requirements:

   1. If you wear a respirator in a confined space, you shall follow Chapter 7.2, "Respiratory protection," of this handbook.

   2. Use only NIOSH-approved respirators.

   3. Use a self-contained breathing apparatus (SCBA) only when you can fit through the entry openings with an SCBA strapped on. If you can't do this, or if free space opening is less than or equal to 18 inches in diameter, use a supplied-air respirator.

   4. Use only certified breathing air (Compressed Gas Association, Grade D).

   5. See Chapter 5.6, "Personal protective equipment," of this handbook for more requirements on PPE.

24. Rescue and emergency equipment

You shall have non-entry rescue and emergency equipment in place before anyone enters the confined space as required in the approved procedures. Never enter a confined space to rescue someone. You shall have:

a. Retrieval equipment for anyone who enters an OSHA permit-required confined space, unless that equipment would increase the overall risk of entry or would not help you rescue an entrant. Each entrant shall have the following retrieval equipment:

   1. A chest or full-body harness with a retrieval line that meets ANSI A10.14, "Construction and Demolition Operations – Requirements for Safety Belts, Harnesses." You shall attach the retrieval line at the center of the entrant's back, near shoulder level, or above the entrant's head. Inspect harness and lines before each use and load test them yearly as described in the manufacturer's instructions.

   2. Wristlet harnesses instead of a chest or full-body harness if access to the confined space is less than 18 inches in unobstructed diameter. You may also use wristlet harnesses if you can show that a chest or full-body harness isn't feasible or creates a greater hazard. You need to show that wristlet harnesses are the safest and most effective alternative. The Safety and Test Operations Division and the Clinical

Services Branch shall approve any exceptions.

Note: Wristlets are designed to help remove people from confined spaces by extending their arms, but are not designed to lift a person out of a space. Use a full-body harness instead.

3. A retrieval line from the harness that is attached to a mechanical device or fixed point outside the space so that you can begin rescue if you are aware that rescue is necessary.

b. A mechanical hoist and supporting structure over the opening for OSHA permit-required confined spaces with top-opening entrances or that are vertical and more than 5 feet deep. The entry supervisor may require hoist and support for JSC permit-required confined spaces with top-opening entrances.

c. Extra supplied air respirators for rescuers if the entrants use supplied air respirators to work in the space. You usually use supplied air respirators if openings aren't large enough for SCBAs or the job will last longer than an SCBA's air supply. Inspect and check all rescue respirators before anyone enters the space.

d. Any other equipment necessary to safely rescue someone from the space.

e. A method of contacting emergency services as required in the approved procedures.

25. What to do in an emergency

Remember, your emergency numbers are: x33333 at JSC, Sonny Carter Training Facility, and Ellington Field, 911 at any off-site location, and x5911 at WSTF.

In an emergency, you as an ***attendant*** or ***entry supervisor*** shall:

a. Follow your emergency procedures. Never attempt to rescue a worker from a confined space until you call your emergency number or call for a rescue team.

b. Never enter a confined space to rescue someone. Only approved rescue teams that meet the requirements of 29 CFR 1910.146(k) and are approved by the Safety and Test Operations Division and the Occupational Health Department may enter a confined space for rescue.

c. Make sure an MSDS or similar written information is provided to the medical facility treating an entrant who is exposed to a hazardous substance if you have the MSDS or information at your worksite.

d. Coordinate with local fire and ambulance services if you rely on them for confined space rescues by:

1. Telling them about the hazards that they may face during confined space rescues.

2. Having them visit all confined spaces to which they may be called so that they can develop rescue plans for each space and practice rescue operations.

Other requirements for entering confined spaces

26. Training for working in confined spaces

Training needs to provide supervisors, attendants, and entrants with the knowledge and skills needed to work safely in confined spaces. Training shall follow these requirements:

a. If you are involved with any work in a confined space, you shall have training:

1. Before you are first assigned duties in confined spaces and before your assigned duties change.
2. Whenever work in a confined space presents new hazards you have no training for.
3. Whenever you think that there are deviations from entry procedures or that your knowledge or use of the procedures may be inadequate.
4. By taking JSC's Confined Space Entry course. This course meets the requirements of 29 CFR 1910.146 for entry supervisors, attendants, and entrants. You may also take current off-site training after you attend an overview of JSC's confined space program and demonstrate that you understand JSC's program.
5. By getting a training completion card that states that you have been trained and demonstrated proficiency in JSC's confined space requirements. The card is good for 2 years. Then you shall be retrained.

b. As an ***entry supervisor***, you shall at least have training in JSC's confined space entry program and in your duties listed in paragraph 18 of this chapter.

c. As an ***entry attendant,*** you shall at least have training in JSC's confined space entry program and in your duties listed in paragraph 19 of this chapter.

d. As an ***authorized entrant***, you shall at least have training in JSC's confined space entry program and in your duties listed in paragraph 20 of this chapter.

27. Off-site contracts that involve entering confined spaces

For off-site contractors involved in entering confined spaces:

a. If you arrange to have employees of an off-site contractor perform work in a confined space, you shall:

1. Inform the contractor that the workplace has confined spaces and that the contractor needs to follow JSC's confined space entry program when working in confined spaces.
2. Tell the contractor why a space in question is a confined space, including the hazards identified and JSC's experience with the space.

3. Tell the contractor of any precautions or procedures that JSC has implemented under its program to protect employees in or near the spaces that contractor personnel will be working in.
4. Make sure that contractor employees who will enter confined spaces receive the training in paragraph 25 of this chapter.
5. Coordinate entry operations with the contractor.
6. Debrief the contractor when the job is done about JSC's permit space program and the hazards found or created in the spaces during entry operations.

b. If you are the contractor in subparagraph a above, you shall follow JSC's confined space requirements in this chapter and:

1. Obtain any available information on permit space hazards and entry operations from the contracting organization.
2. Make sure that all employees who will work in confined spaces are trained as described in paragraph 25 of this chapter. They shall also provide documentation of prior class work in confined space entry, receive the JSC confined space overview, and demonstrate an understanding of JSC's program.
3. Coordinate entry operations with the contracting organization.
4. Inform the contracting organization of any hazards that you find or create in any confined space, either at a debriefing or while you are working.

28. For more information on entering confined spaces

You can find more information on entering confined spaces in these documents:

a. 29 CFR 1910.146, "Permit-Required Confined Spaces"
b. ANSI A10.14-91, "Safety Belt Use"
c. ANSI Z1171.1-1989, "Standard on Confined Space Entry"
d. NIOSH Criteria Document on Working in Confined Spaces
e. NIOSH Publication IF 87-113, "A Guide to Safety in Confined Spaces"
f. NHS/IH 1845.2, Publication No. 80-106, "Entry Into and Work in Confined Spaces"

Requirements for controlled areas

29. Definition of a controlled area

A controlled area is one that

a. An employee can completely enter and work in the area, but is not, by definition, a confined space.

b. Periodically contains, or can, after a single point failure, contain a hazardous atmosphere where employees are present that may expose them to the risk of death, or acute illness, injury, incapacitation, and impairment of ability to self rescue from any of the following conditions:

   1. Flammable gas, vapor, or mist in excess of 10% of its lower explosive limit (LEL).
   2. Airborne combustible dust at a concentration that meets or exceeds its LEL.
   3. Atmospheric oxygen concentrations below 19.5% or above 23.5%. Note: Atmospheric oxygen concentrations may vary significantly due to stratification or inadequate mixing; e.g., be acceptable at one location but not another.
   4. Atmospheric concentration of any substance for which there is a published exposure limit and which could result in employee exposure in excess of that limit.

c. Contains any other condition that is immediately dangerous to life or health.

Examples of controlled areas include:

- Vacuum chambers (during non-test conditions).
- Hyperbaric and hypobaric chambers.
- WSTF Altitude Test Stands.
- Enclosed outdoor areas for loading liquid nitrogen.
- Laboratories with compressed or plumbed gas lines or LN2 dewars.
- Temporary work areas where construction, welding or other work processes can create the conditions described above.

30. Identifying a controlled area at JSC

To identify controlled areas, you shall:

a. Evaluate your work areas to identify any controlled areas. Consult safety or health representatives to help in the determination. Consider the area based on its use when personnel are present. For example, evaluate the interior of a vacuum test chamber during periods for maintenance, test article mounting, instrumentation set-ups, etc. Do not evaluate a vacuum chamber while it is at vacuum under test conditions.

b. Designate an area as "controlled" if occupational safety or health representatives determine it should be a controlled area after close calls, mishap, hazard analysis, or other inspection indicate hazards require additional mitigation or monitoring.

   NOTE: Depending on the configuration of the area, a controlled area may be upgraded to a JSC or OSHA permitted confined space.

31. What to do if you have controlled areas in your work area

If you, as a facility manager or line manager, have a controlled area in your work area, you shall:

a. Ensure the controlled area is covered by a Hazard Analysis per chapter 2.4 of this document. The Hazard Analysis shall also include:
    1. Control of both hardware configuration and procedures that may generate the hazardous condition. Consider an entry checklist, procedure, warning signs, or training.
    2. Any critical timing associated with the controls. Note that there are trades to be made. If the valve were closed and locked the critical time may be extended to a shift or longer.
b. Notify the Clinical Services Branch of the controlled area.
c. Include the hazard analysis in the facility baseline documentation if required by chapter 10.4.
d. Periodically assess the effectiveness of controls by field inspection.

32. Responsibilities

The following organizations have responsibilities for controlled areas:

a. The Clinical Services Branch shall:
    1. Maintain a list of controlled areas under these requirements.
    2. Assess the effectiveness of controlled area controls yearly.
b. The Safety and Test Operations Division shall:
    1. Assess the hazard analyses and controls during audits of the facility.
    2. Assess workplace conditions for compliance with these requirements during periodic facility inspections.

Chapter 7.3
Radiation protection

This could be you . . .

A researcher ingested radioactive dust. He made notes on his work and then held his pencil, which had dust on it from his hands, in his mouth.

1. Applicability of this chapter

You are required to follow this chapter if you handle radioactive materials or radiation-producing equipment.

2. What this chapter covers

This chapter covers the minimum requirements for handling and using radioactive materials or radiation-producing equipment. The chapter includes ionizing radiation such as X-ray diffraction units and nonionizing radiation such as that produced by radar and microwaves.

Requirements for ionizing radiation

3. Ionizing radiation and why is it harmful

Ionizing radiation is any of the following: alpha particles, beta particles, gamma rays, X rays, neutrons, high-speed electrons, protons, and other atomic particles. Ionizing radiation doesn't include sound waves, microwaves, radio waves, or visible, infrared, or ultraviolet light. These are covered in the next subchapter. Ionizing radiation is harmful because it alters the cells of the human body and could produce cancer and other chromosome damage.

4. Precautions to take when working with ionizing radiation

If you work with ionizing radiation, you shall:

a. Get approval to bring radioactive materials or radiation-producing devices onto JSC, Sonny Carter Training Facility, Ellington Field, and White Sands Test Facility. *No one*, whether NASA employees, contractors, visiting scientists, post-doctorate researchers, visiting product vendors, etc., is allowed to bring any radioactive materials or radiation-producing devices onto JSC-, Sonny Carter Training Facility-, Ellington Field-, or White Sands Test Facility-controlled property until he or she gets approval from the NASA/JSC Radiation Safety Officer.

b. Make sure you have been authorized by the Radiation Safety Committee (RSC) to work with radioactive materials or radiation-producing equipment. See specific authorization procedures described in Part 3 of JPR 1860.2, "Radiological Health Manual."

c. Wear appropriate protective clothing whenever you or your clothing could be contaminated.

d. Wear personnel-monitoring equipment (usually dosimeters) if you work in a "Radiation Area." The JSC Radiation Safety Officer (JSC RSO) may require you to have a bioassay to check your level of internal radioactive material uptake.

e. Make sure that you don't expose yourself or anyone else to radiation unnecessarily or beyond the permissible exposure levels contained in Part 3.9 of JPR 1860.2.

f. Keep contamination levels as low as possible. Make sure that you don't carry contamination beyond restricted areas. See Part 3.6 of JPR 1860.2 for specific procedures on personnel and area contamination and maximum permissible contamination levels.

g. Have written emergency response plans for both major and minor spills and releases as required by the RSC. Report to the JSC RSO and the Facility Manager as soon as possible after any incident where:

   1. Someone could have been overexposed to radiation.

   2. Government equipment could have been damaged due to a spill or loss of control of a radiation source.

h. Use appropriate signs to mark restricted, radiation, high-radiation, or very-high-radiation areas. Mark any area that requires personnel-monitoring equipment. Standard signs with the radiation CAUTION symbol are available from the JSC RSO. Part 3.6 of JPR 1860.2 describes specific sign requirements.

5. Controlling radioactive materials and radiation-producing equipment

You control radioactive materials and radiation-producing equipment by tracking when and where it comes on site, where it is stored and used, how it is transferred, and how it is disposed of. Follow these precautions:

a. The JSC RSO or designee shall approve all purchase requests for or any evaluations of radioactive material or radiation-producing equipment. They will survey new packages containing radioactive material promptly (usually at logistics receiving) for contamination and radiation levels. See Part 3.5 of JPR 1860.2 for specific procedures.

b. The JSC RSO needs to approve all storage and use areas for radioactive material. You shall:

   1. Mark each room or area in which radioactive material is used or stored as containing radioactive material.

2. Label each container of radioactive material as such. Part 3.5c of JPR 1860.2 describes specific marking and labeling procedures.

c. Document all transfers of licensed material, making sure that the material is properly identified and the radiation levels are controlled. The JSC RSO or designee shall:

1. Approve and keep a record of all radioactive material shipments.

2. Certify that materials are properly classified, described, packaged, marked, and labeled under applicable regulations (both NRC and DOT). Part 3.5d of JPR 1860.2 describes specific procedures for transferring licensed material.

d. Request disposal through the JSC RSO. Only a licensed radioactive waste disposal contractor may dispose of radioactive wastes. There are limited exceptions. Don't release radioactive gases or particulate radioactive material into the air. Part 3.13 of JPR 1860.2 describes specific procedures for disposing of waste.

6. Special requirements for off-site contractors doing radiographic work on site

If you are doing any kind of work involving radiation on site at JSC, you shall follow all requirements in this handbook as well as in JPR 1860.2. In addition, you shall notify the JSC RSO 24 hours before beginning work or before bringing radioactive materials or equipment on site.

Requirements for non-ionizing radiation

7. Nonionizing radiation and why is it harmful

Nonionizing radiation includes any of the following from the electromagnetic radiation spectrum: ultraviolet rays, visible light, lasers (for laser controls, see Chapter 6.2 of this handbook), infrared radiation, radar, radio waves, microwaves, and Hertzian waves. Equipment that produces nonionizing radiation includes radio frequency (RF) and microwave devices such as radar, telemetry, communications systems, and test equipment; laser systems and optical devices; and microwave ovens. Nonionizing radiation is classified as a physical agent and can be harmful because it produces thermal and other effects that damage cells in the body. RF and microwave devices may cause these effects through electric and magnetic fields and induced currents. For more information on hazards from nonionizing radiation at JSC, contact the JSC Radiation Safety Office.

8. Exposure limits for nonionizing radiation

The exposure limits for nonionizing radiation depend on frequency. JSC uses limits found in the ACGIH publication "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices" (latest version). You can find additional information on exposure limits for RF radiation in the ANSI/IEEE C95.1 Standard, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency

Electromagnetic Fields, 3 kHz to 300 GHz." Remember, as with all hazardous physical agents, keep the exposure as low as reasonably achievable. Contact the JSC Radiation Safety Office for assistance in determining the specific exposure limit for the nonionizing radiation from your equipment, process, procedure, or application.

9. Approvals for using equipment that produces nonionizing radiation

You shall receive approval from the JSC RSO/Laser Safety Officer before using any nonionizing radiation source that can cause health or biological damage. UL-listed COTS equipment that isn't modified is exempt from this requirement.

10. Information to provide and precautions to observe to get approval for using equipment that produces nonionizing radiation

You shall:

a. Describe the potential nonionizing radiation hazards and their controls to all personnel within the area.

b. Make sure that everyone in the area knows your emergency procedures.

c. Make sure that everyone who uses the equipment has demonstrated a thorough knowledge of the system operations and safety precautions.

d. Immediately notify the JSC RSO and the area supervisor of any known or suspected mishap from your nonionizing radiation source.

e. Notify the JSC RSO and the area supervisor of modifications to previously authorized nonionizing radiation systems. Don't operate the modified system without prior JSC RSO approval. Your modification may require approval by the JSC RSO or the RSC.

11. Precautions when working with nonionizing radiation

You shall follow these precautions when working with nonionizing radiation:

a. Don't look into waveguide horns, antennas, or open waveguides when any microwave equipment is on.

b. Don't stay around high-frequency radiation over 25 mW/cm^2.

c. Ask the Radiological Safety Office to measure and evaluate the X-ray hazard posed by all equipment with voltages over 15,000 V.

d. Don't wear metal jewelry or eyeglasses near electronic equipment radiating RF energy, even if the level is below the established safe value. Jewelry or eyeglasses may act as a conductor and cause a shock or burn.

e. Follow Chapter 6.2 of this handbook, "Laser safety and health," for using and controlling lasers.

12. Requirements for RF interference

For RF interference, you shall:

a. Make sure that the operation of industrial, scientific, medical, and other equipment generating RF energy doesn't interfere with authorized radio, radio-navigation, and telecommunication systems.

b. Treat equipment generating RF energy between 30 Hz and 30,000 MHz as a cause of interference unless you provide the equipment with power line filters, shielding, bonding, and grounding.

c. Keep RF energy within the limits in Chapter 7 of the *Manual of Regulations and Procedures for Federal Radio Frequency Management*.

13. For more information on radiation protection

You can find more information on radiation protection in these documents:

a. 10 CFR, "U.S. Nuclear Regulatory Commission Rules and Regulations"

b. 21 CFR 1000 – 21 CFR 1040, "Food and Drug Administration Rules and Regulations"

c. 29 CFR 1910.1096, "Ionizing Radiation"

d. 29 CFR 1910.97, "Nonionizing Radiation"

e. 49 CFR 177, "Carriage by Public Highway"

f. ANSI/IEEE C95.1, " IEEE Standard for Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," American National Standards Institute, 1982

g. JPR 1860.2, "Radiological Health Manual"

h. JPD 1860.4, "Radiological Protection Policy"

i. JPR 1107.1, "The JSC Organizations," paragraph 4.5, "JSC Radiation Safety Committee"

j. JPC 1152.15, "Medical Isotopes Subcommittee of the JSC Radiation Safety Committee"

k. *Manual of Regulations and Procedures for Federal Radio Frequency Management,* U.S. Department of Commerce, Chapter 7: "Authorized Frequency Usage," National Telecommunications and Information Administration, Washington, D. C., 1989

l. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices (TLVs® and BEIs®),* American Conference of Governmental Industrial Hygienist, latest edition

m. ANSI/IEEE C95.1 Standard, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz"

n. Presidential Guidelines for Diagnostic X-Rays at Federal Installations, approved January 16, 1978

14. Responsibilities for radiation safety

a. As a ***supervisor***, you are responsible for:

1. Making sure that your employees participate in the JSC Radiation Protection Program.
2. Providing training to your employees in their radiation tasks and procedures.
3. Assuring that all JSC issued personal radiation dosimetry devices are returned to the Radiation Safety Office in conjunction with all employment termination.

b. As the ***JSC RSO***, you are responsible for:

1. Implementing JSC's radiation protection program.
2. Supervising the Radiation Safety Office.
3. Answering to the JSC Radiation Safety Committee.
4. Being appointed by the Director, Space and Life Sciences.
5. Following your specific JSC RSO responsibilities described in Part 2.4 of JPR 1860.2.

c. The ***Director of the Space and Life Sciences*** is responsible for:

1. Making sure that the radiation protection program is developed and carried out.
2. Securing licenses or permits where required.
3. Establishing an RSC.

d. The ***Radiation Safety Committee*** is responsible for:

1. Coordinating the requirements for controlling radiation among the various agencies that regulate radiation.
2. Approving all uses of radiation on site.

e. The ***Radiation Safety Office*** is responsible for:

1. Reviewing procedures.
2. Monitoring operations.
3. Educating personnel in radiation protection and in the safe handling of radioactive materials and radiation-producing equipment.
4. Providing radiation dosimetry equipment such as thermo-luminescent dosimeters, pocket dosimeters, warning signs, and labels for radiation or radioactive materials.
5. Making sure that all operations meet NRC requirements.

Chapter 7.4
Biosafety and bloodborne pathogens

This could be you . . .

A janitor was stuck by a hypodermic needle left in a trash can.

An employee found blood drops around his work area.

1. Applicability of this chapter

You are required to follow this chapter if you work with, or may be exposed to, biohazards including blood and "other potentially infectious materials" as a part of your job. JSC has adopted the recommendations found in the Centers for Disease Control and Prevention and National Institutes of Health "Universal Precautions" and "Biosafety in Microbiological and Biomedical Laboratories" for controlling biohazards in the workplace. If you don't work with blood or body fluids but find them in your work area, follow paragraph 2 below. If you are a supervisor, paragraph 20 lists your responsibilities for biohazards.

2. What to do if you discover blood or other potentially infectious body fluids

If you find blood or other potentially infectious body fluids around your work area, you shall:

a. Leave it alone. Without the proper training and equipment, you risk getting a bloodborne disease.

b. Block off the area to prevent others from contacting it.

c. Report it to Emergency Operations Center Security Dispatcher at (281) 483-4658 and to your facility manager. They will send janitorial personnel trained in bloodborne pathogens to clean it up.

d. If the incident is an emergency, call x33333, JSC's emergency number.

3. Biohazards and bloodborne pathogens

The following definitions apply to this chapter:

a. ***Biological hazards or biohazards*** are those infectious agents that present a risk of death, injury, or illness to employees. Bloodborne pathogens and other potentially infectious materials (subparagraphs b and c below) are considered biohazards.

b. ***Bloodborne pathogens*** are pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV).

c. ***Other potentially infectious materials*** is an OSHA definition that includes:

1. The following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids.
2. Any unfixed tissue or organ (other than intact skin) from a human (living or dead).
3. HIV-containing cell or tissue cultures, organ cultures.
4. HIV- or HBV-containing culture medium or other solutions.
5. Blood, organs, or other tissues from experimental animals infected with HIV or HBV.

4. OSHA requirements for bloodborne pathogens

If your job description includes possible exposure to blood or "other potentially infectious materials," you shall follow the OSHA 29 CFR 1910.1030, "Bloodborne Pathogens."

5. How to determine whether you work in a job that exposes you to biohazards or bloodborne pathogens

a. JSC Space and Life Sciences has a Biosafety Review Board that evaluates the use of any new potential biohazardous or pathogenic materials. The Biosafety Review Board audits laboratories yearly for safe handling and storage of bloodborne pathogens and biological materials. Anyone, employees or visitors, who brings biohazardous materials onto JSC or who plans to implement a process using biohazardous materials shall have approval from the Biosafety Review Board per JSC 63828, "Biosafety Review Board Operations and Requirements Document," before use or implementation.

b. The Clinical services Branch evaluates all areas where civil service or contract workers could be exposed to bloodborne pathogens. Your management shall help in evaluating these areas.

6. Biosafety levels and precautions you must take for each

You shall never bring any biosafety level (BSL) 2 materials on site without the prior approval of the Biosafety Review Board. BSL 3 or 4 materials are prohibited on site.

You must classify all biohazards or biological materials as Biohazard 1, 2, 3, or 4. You must also follow the requirements in the table below for the biosafety level that matches the biohazard classification when working with any biohazardous material in a laboratory or clinical setting.

BSL . . .	*Involves these agents . . .*	*Follow these practices . . .*	*Use this safety equipment (primary barriers) . . .*	*Use these facilities (secondary barriers) . . .*
1	Not known to cause disease in healthy adults	Standard micro-biological practices	None required	Open bench-top sink required
2	Associated with human disease, hazard = auto-inoculation, ingestion, mucous membrane exposure	BSL 1 practice plus: Limited access; biohazard warning signs; "sharps" precautions; biosafety manual defining any needed waste decon-tamination or medical surveillance policies	Class I or II biosafety cabinets (BSCs) or other physical containment devices used for manipulating any agents that cause splashes or aerosols of infectious materials PPE: laboratory coats; gloves; face protection as needed	BSL-1 plus: Autoclave available
3	Indigenous or exotic agents with potential for aerosol transmis-sion; disease may have serious or lethal consequences	BSL-2 practice plus: Controlled access; decontaminate all waste; decontaminate lab clothing before laundering; baseline serum	Class I or II BSCs or other physical containment devices used for manipulating any agents PPE: protective lab clothing; gloves; respiratory protection as needed	BSL-2 plus: Physical separation from access corridors; self-closing, double-door access; exhausted air not re-circulated; negative airflow into lab
4	Dangerous or exotic agents that pose a high risk of life-threatening disease, aerosol-trans-mitted lab infections; or related agents with unknown risk of transmission	BSL-3 practice plus: Change clothing before entering; shower on exit; decontaminate all material when exiting facility	Conduct all procedures in Class III BSCs or Class I or II BSCs with full-body, air-supplied, positive-pressure personnel suit	BSL-3 plus: Separate building or isolated zone; dedi-cated supply and exhaust, vacuum, and deconditioning systems; other requirements outlined in the test

7. Exposure control plan

Any organization or company whose employees may be exposed to blood and "other potentially infectious materials" needs to have a written exposure control plan that is tailored to the work area and designed to minimize worker exposure. The plan shall contain the items listed in 29 CFR 1910.1030(c) and include but not be limited to:

a. Exposure determination and hazard analysis, which describe the occupation and tasks with exposure.

b. Methods to comply with applicable requirements.

c. Communicating hazards to exposed employees.

d. Recordkeeping.

e. The procedures to follow after an exposure to blood or other infectious materials.

f. Hepatitis B vaccination option.

You must update the written exposure control plan yearly.

8. Precautions to take when working with blood or other potentially infectious materials

If you work with any of the blood or body fluids listed above, you shall observe these "universal precautions: "

a. Treat all blood and body fluids as infectious. Urine, feces, saliva, breast milk, and vomit are not considered potentially infectious materials unless they are visibly contaminated with blood.

b. Always wear appropriate PPE such as gloves, lab coats or aprons, and eye or face shields for the task at hand.

c. Wash your hands with biocidal soap immediately after removing your PPE or coming in contact with blood or body fluids.

d. Remove all PPE before leaving the work area and place in the appropriate container for storage, decontamination, or disposal.

e. Don't eat, drink, smoke, apply cosmetics, or handle contact lenses in the work area.

f. Don't store food and drink in refrigerators or freezers where blood or other infectious materials are stored.

g. Minimize splashing and spraying blood or other infectious materials while handling them, while cleaning equipment, or during any other clean-up procedure.

h. Don't pipet or suction with your mouth.

i. Make sure all ventilation hoods and biological safety cabinets are inspected at least every year.

9. Precautions when using needles

If you use needles with blood or other infectious materials, you shall observe these precautions:

a. Don't shear, bend, or break used needles.

b. Don't recap or re-sheath by hand.

c. Don't remove used needles from disposable syringes.

d. Dispose of used needles in an approved biohazard container.

10. Housekeeping precautions

Housekeeping is an important part of your protection, so you shall observe these requirements:

a. Disinfect all work surfaces with an appropriate biocide at the end of each work shift or when they are contaminated.

b. Replace protective coverings, such as foil or plastic wrap used to protect equipment, at the end of the work shift or when they become contaminated.

c. Disinfect all waste containers labeled biohazard on a regular schedule and clean them when they are visibly contaminated.

d. Don't pick up broken glassware with your hands. Use tongs or a brush and dustpan. Dispose of broken glassware in a puncture-proof biohazard container so it won't injure other workers.

e. Place all specimens in a closeable, leak-proof container and label the container before storing or transporting.

f. Use a secondary container if the first container is likely to be damaged.

11. Disposal precautions

Disposal is an important part of protecting others, so you shall observe these requirements:

a. Place all infectious waste in closeable, leak-proof containers that are color-coded or labeled as described in paragraph 12 below.

b. Keep infectious waste separate from other waste.

c. Wear protective gloves when handling infectious waste.

d. Make sure that infectious waste is picked up and transported by trained personnel only and that it is disposed of in a biological incinerator. In emergencies, first responders may take properly bagged waste to the JSC Clinic for disposal during working hours.

e. Minimize handling laundry that is contaminated. Bag it at the site in a properly labeled container and take it to a laundry for cleaning.

12. Labeling requirements for blood and body fluids

Labels shall be fluorescent orange or orange-red and include the word BIOHAZARD and the biohazard symbol in a contrasting color. Place this warning sign on all containers of infectious waste, and on refrigerators or freezers that contain infectious materials. You may use red bags or containers in addition to labels for containers of infectious waste.

13. Protective clothing and equipment to use when working with blood and potentially infectious materials

You shall wear the following protective equipment:

a. Gloves, latex or another type if you are allergic to latex

b. Lab coat or apron and eye and face protection if splashing or spraying is possible

14. Hepatitis B virus vaccination

The JSC Clinic provides HBV vaccine to all on-site contractor and civil service employees in the job classifications listed in the exposure control plan for your area, subject to the following:

a. The Occupational Health Officer shall concur before you get the vaccine.

b. The vaccine shall be offered to you at no cost within 10 working days of being assigned duties that could expose you to blood or other potentially infectious materials. You may decline this vaccine when it is offered by signing a declination form, which is available at the JSC Clinic. If you later change your mind, you can still get the vaccine from the JSC Clinic, still free of charge.

15. Training to work safely with blood and body fluids

You must be trained within 10 working days of being assigned duties that could expose you to blood or other potentially infectious materials and yearly thereafter to handle safely blood and body fluids listed in the "Universal Precautions" of the Centers for Disease Control and Prevention. Your training shall include:

a. A copy of 29 CFR 1910.1030 and an explanation of its contents.

b. A general explanation of the epidemiology, symptoms, and modes of transmission of bloodborne diseases.

c. An explanation of how to recognize activities that may involve exposure to blood and other potentially infectious material.

d. An explanation of the use and limitations of practices that will prevent or reduce exposure, including appropriate engineering controls, work practices, and PPE.

e. Information on the types, selection, proper use, location, removal, handling, decontamination, or disposal of PPE.

f. Information on the HBV vaccine, including information on its effectiveness, safety, the benefits of being vaccinated, and that the vaccination will be offered to you free of charge.

g. Information on the appropriate actions to take and persons to contact if you or someone else is exposed to blood or body fluids.

h. An explanation of the procedure to follow if an exposure incident occurs, including how to report the incident and the medical follow-up that will occur.

i. Information on the post-exposure evaluation and follow-up that will be provided for you after an exposure incident.

j. An explanation of the signs, labels, and the color-coding system.

k. An opportunity to ask questions of the person conducting the training session. Training is available through the Clinical services Branch.

l. Information on the Centers for Disease Control Prevention's Communicable Hotline (1-800-342-2437) to receive personal, confidential, and reliable information.

m. See Chapter 4.1, "Program Description" for safety and health training, of this handbook for more information on training.

16. What to do if you are exposed to blood or other infectious materials

If you are exposed to blood or body fluids, get medical treatment immediately. Getting proper treatment within 2 hours of exposure might prevent you from contracting a bloodborne disease. If you are treated at an outside medical facility, go to your site clinic as soon as possible for a follow-up visit. Follow the table below:

If the exposure is . . .	***Then . . .***
An emergency where you need an ambulance	• Call x33333 at JSC, Sonny Carter Training Facility, and Ellington Field, 911 at any off-site location, or x5911 at White Sands Test Facility.
To the eye, mouth, other mucous membrane, or non-intact skin	• Flood the area with water for 15–20 minutes or wash with soap. • Go to the JSC Clinic or emergency room if the Clinic is closed for post-exposure follow-up.
To intact skin	• Immediately and thoroughly wash the affected area with biocidal soap. • Go to the JSC Clinic or emergency room if the Clinic is closed for post-exposure follow-up.

17. Clinic actions for exposure

For JSC employees, the JSC Clinic will provide a confidential medical evaluation to you if you have been exposed and will:

a. Document the:

1. Route(s) of exposure.

2. HBV, HCV, and HIV antibody status of the source individual, if known.

3. The circumstances under which the exposure occurred.

4. Any "first-aid" or "prophylactic" measures that you received.

b. Collect and test the source individual's blood to determine the presence of HIV, HCV, or HBV infection, if the source individual can be identified and permission is given. You will be informed of applicable laws and regulations about disclosing the identity and infectious status of the source individual.

c. Collect blood from you as soon as possible after the exposure incident to determine your HBV, Hepatitis C, and HIV antibody status.

d. Follow up on you, including the following:

1. Antibody or antigen testing
2. Counseling
3. Evaluation of reported illnesses
4. Safe and effective post-exposure treatment under standard recommendations for medical practice

18. JSC medical records for bloodborne pathogens

The following govern JSC medical records for bloodborne pathogens:

a. The JSC Clinic keeps all medical exposure records for the duration of your employment plus 30 years.

b. These medical records are available to you and anyone with your written consent.

c. You shall file an injury report (JSC Form 340) for any exposure. The Safety Office will send a copy to your supervisor or company.

19. For more information on biohazards and bloodborne pathogens

You can find more information on bloodborne pathogens in these documents or contact the JSC Clinic:

a. 29 CFR 1910.1030

b. "Universal Precautions" guidelines from the Centers for Disease Control and Prevention

c. "Bio Safety in Microbiological and Bio medical Laboratories," published by the Centers for Disease Control and Prevention and the National Institutes of Health

20. Responsibilities for bloodborne pathogen safety

As a ***supervisor***, you are responsible for:

a. Controlling all exposures to bloodborne pathogens through a written exposure control plan designed to minimize worker exposure.

b. Making sure your employees follow the requirements of this chapter and your exposure control plan.

c. Making sure your employees are trained in protecting themselves from bloodborne pathogens.

d. Providing adequate PPE.

e. Offering to all employees the Hepatitis B vaccination and training within 10 working days of being assigned to a job in which they could be exposed.

Chapter 8.1
Electrical safety

This could be you . . .

During a late-night shift when no electrical technician was available, a mechanical technician was instructed to work on a live electrical panel in a test area. He was shocked by 480 volts, but received only minor burns to the thumb.

A worker suffered flash burns when his scraper was vaporized by high-voltage electricity while scraping a louvered duct for painting. The duct contained a power buss, and the scraper entered a louver and shorted the buss to the duct.

1. Applicability of this chapter

You are required to follow the requirements in this chapter if you design, install, maintain, or work on electrical equipment or if your work exposes you to the hazards of electricity.

2. What this chapter covers

This chapter covers the minimum requirements for work on power generation, transmission, and distribution systems, motors, transformers, rectifiers, voltage regulators, batteries, battery chargers, and associated components. There are additional requirements for working with batteries in Chapter 6.1, "Battery safety," of this handbook.

Working on electrical equipment safely

3. Electrical safety program

The following describes JSC's electrical safety program:

a. **Electrical safety program principles.** JSC workers and organizations shall:

1. Follow NFPA 70E, to include arc flash requirements.
2. Inspect and evaluate the electrical equipment. *This includes* testing test equipment used after each test.
3. Maintain the electrical equipment's insulation and enclosure integrity.
4. Classify circuits operating at or above 600 volts nominal or 600 root mean square as SAFETY CRITICAL. An electrical crew supervisor or contractor safety officer shall approve your written procedures, and your supervisor shall be present during operations.

b. **Electrical hazard controls.** As an electrical worker, you shall follow the general principles of hazard control in chapter 3.2 of this handbook and these specific electrical hazard controls:

   1. Consider every electrical conductor or circuit part to be energized until proven otherwise.
   2. Make no bare-hand contact with exposed energized electrical conductors or circuit parts operating at 50 volts or more, unless the bare-hand method is properly used.
   3. De-energize, if possible. Live parts that operate at less than 50 volts to ground need not be de-energized if there will be no increased exposure to electrical burns or to explosion due to electric arcs.

c. **Procedures** as described in NFPA 70E, Article 110 and chapter 5.8, paragraph 13 of this handbook.

d. **Hazard identification and risk assessment** as described in NFPA 70E, Article 110 and chapter 2.4 of this handbook.

e. **Job briefings** as described in NFPA 70E, paragraph 110.

f. **Program audits** every three years and random field audits as described in NFPA 70E, Article 110.

4. Limitations for working on electrical equipment

You shall follow the limitations listed below:

When you are . . .	***You shall . . .***
Maintaining electrical equipment	• Work only on de-energized equipment. (See lockout/tagout (LO/TO) in Chapter 8.2 of this handbook.) • Get an exception to this limitation from the appropriate authority by performing and documenting an investigation. Your company or directorate shall have policies for working on energized equipment that clearly define the "appropriate authority." Only designated "qualified electricians" or "electronic technicians" may work on energized equipment. (See National Fire Protection Association Standard 70E, Article 130.) • Verify that equipment cannot be re-energized by attempting a restart using the normal operating controls (where possible) to make sure the equipment or system will not operate. You may need to request a remote restart. (See LO/TO in Chapter 8.2 of this handbook.) • Make sure that all covers, barriers, housings, and containment

	devices are in place.
Doing maintenance, repair, or construction on overhead line or in a substation, where the wiring is congested and you are exposed to or must handle energized equipment	• Have at least one additional employee who watches the other workers and warns them if they get near live conductors or helps them if there is an accident. • Have at least two CPR-qualified employees on site. • Assign enough qualified workers to perform the work safely if you are a supervisor.
Doing potentially hazardous operations	• Limit access to the work area to authorized personnel only.

5. Controls for working more safely on electrical equipment

You shall implement the following controls:

If you are . . .	***Then you shall. . .***
Doing an inspection or maintaining equipment	• Be qualified to inspect and maintain the electrical equipment. • Inspect the equipment at predetermined intervals.
Adjusting equipment	• Never adjust any part of electrical or electronics equipment if there is a risk that you can contact unprotected energized equipment. • Get approval from the electrical supervisor and the Safety and Test Operations Division if you must work on circuits at or over 50 Vac.
Working around energized electrical circuits	• Never wear rings, watches, neck chains, or other metallic objects that are electrical conductors. • Wear the proper PPE. • Work on energized equipment ONLY if you are a designated "qualified electrician" or "electronic technician." (See National Fire Protection Association Standard 70E, Article 130.)

If you are . . .	***Then you shall. . .***
Repairing or testing electronic equipment on a work bench	• Keep work benches clean at all times. • Ground all metal work benches.
Working on poles	• Follow the requirements in 29 CFR 1910.268, "Telecommunications," 29 CFR 1910.269, "Electric Power Generation, Transmission, and Distribution," and 29CFR 1926.950–960, "Power Transmission and Distribution." • Inspect all poles before climbing them to do line work, and pike or support them before climbing if they are rotten or weak. • Use proper PPE, tools, and barriers to protect workers from energized circuits. • As a pole climber (lineman), firmly set your spurs and fasten your safety belt before working on pole-mounted electrical lines or equipment. • As the first of two linemen working on the same pole, be in the working position (safety belt fastened) before the second lineman climbs the pole. • Complete all work on one line or phase before working on another, never work on two lines or phases simultaneously when on a pole.

If you are . . .	*Then you shall. . .*
	• Never intentionally drop anything from a pole to the ground or allow anything to be tossed up to you. • Turn your head away to diminish the risk of injury from an arc blast when opening primary disconnects or cutouts. • Use certified connect/disconnect extension poles when possible.
Working on micro-wave equipment	• Know about radiation hazards before working on microwave equipment to avoid possible tissue injury, particularly to the eyes. • Never examine or adjust radiators, waveguide openings, or horns during transmission. • Post warning signs that follow 29 CFR 1910.97 if someone may inadvertently enter the path of a microwave beam greater than 10 mw/cm^2.
Grounding equipment	• Ground non-current-carrying metal parts exposed to contact by personnel with a continuous conductor from the device to a known good ground point. • See National Fire Protection Association Standard 70, "National Electric Code," Article 250, "Grounding," and OSHA 29 CFR 1910.302–308, Subpart S, "Electrical," for requirements. • Ensure that semi-portable equipment such as generators, electric hand tools, and floodlights are properly grounded. • Maintain the protective ground on the metal enclosures during movement, unless the supply circuits are de-energized.
Cleaning electronic equipment	• Use only approved and authorized solvents to clean electronic equipment. • Provide adequate ventilation and PPE as directed in the MSDS for the solvent (see Part 9 of this handbook for details on hazardous materials).
Working on high-voltage systems	• Have at least two persons trained in CPR per work crew.
Locking or tagging (equipment	• Follow the requirements of OSHA 29 CFR 1910.147, "The Control of Hazardous Energy (Lockout/Tagout)." (See LO/TO in Chapter 8.2 of this handbook.)

6. Requirements, besides this chapter, to follow for working safely with electrical equipment

You shall follow the regulations listed below:

If you are . . .	*Follow . . .*
Locking or tagging out an electrical energy source	Chapter 8.2 of this handbook, which implements OSHA 29 CFR 1910.147
Working on communications equipment	OSHA 29 CFR 1910.268
Working on high voltage transmission and distribution equipment	OSHA 29 CFR 1910.269
Working on common facility wiring and equipment	• OSHA 29 CFR 1910, Subpart S (all), "Electrical" • National Fire Protection Association Standards 70 and

70E, ”National Electric Code”

Designing and installing electrical equipment

7. Safety design requirements for JSC electrical equipment

You shall design permanent JSC electrical equipment to meet the following requirements:

a. Electrical equipment shall have the following safety features:

For . . .	***You shall use equipment that . . .***
Equipment in ordinary occupancies	• Is listed by UL, FM) or other recognized testing laboratories. • Meets the design requirements of the project specification and of National Fire Protection Association Standard 70.
Equipment in hazardous locations	Meets the design requirements in National Fire Protection Association Standard 70, ”National Electrical Code,” especially Chapter 5, “Special Occupancies,” and OSHA 29 CFR 1910.307, “Hazardous Locations.”
Safety mechanisms	Meets the requirements listed in paragraph 6 above to ensure personnel and equipment safety.
Minimizing accidental contact	• Is designed to locate or guard control boards, switches, transformers, and other hazardous equipment operating at 50 volts or more with grounded railings, barriers, or enclosures. • Has all sharp edges removed and/or isolated from electrical conductors. • Has sufficient room for wiring and maintenance. • Does not apply undue forces on electrical terminations.

b. The equipment design documents shall show voltage, frequency, number of phases, type of raceways, type, number, and size of conductors, and all data pertinent to personnel and equipment safety.

c. The Safety and Test Operations Division shall review electrical systems design.

d. Permanently tag wires, terminals, and equipment with identification numbers that agree with the associated wiring diagrams and schematics.

8. Grounding JSC electrical equipment

Permanent JSC electrical equipment shall meet the following safety requirements for grounding:

a. Follow National Fire Protection Association Standard 70, National Electric Code Article 250, and OSHA 29 CFR 1910.302–308.

b. Show grounding points and grounding details on project drawings and diagrams.

c. Protect the grounds from physical damage.

d. Test newly installed grounding systems and document the tests.

e. Provide an effective separate ground for non-current-carrying metal parts in:

   1. Generators, switches, or motor controller enclosures.

   2. Fuse boxes, distribution cabinets, frames, tracks, and motors of electrically operated equipment.

9. Electrical safety requirements for temporary JSC equipment

JSC temporary equipment shall meet the following requirements:

For . . .	***You shall . . .***
Temporary lines	• Limit service to 90 days unless approved by the Safety and Test Operations Division. • Guard or elevate open wiring with 600 volts or less 10 feet above walkways to prevent accidental contact by workers who may be carrying construction materials or tools.
Cords and connections	• Use portable power tool cords that have an identified grounding conductor connected to the frame or are double-insulated with a UL label. • Use cords that are connected to the grounding contact of an approved plug and UL-listed for the intended use. • Use an appropriately sized GFCI near the power source on temporary circuits that power tools. • Ensure that the extension cords are large enough for the load and are sized to minimize the voltage drop.
Temporary wiring in tanks or confined spaces	• Provide a properly identified FM- or UL-listed switch, which is rated for the environment, at or near the entrance to allow for Emergency Power Shut-Down. • Protect all circuits with GFCIs.

10. Installing and servicing transformers

To install or service transformers, you shall:

a. Control access to ground-level outdoor transformers by:

   1. Completely enclosing them with grounded chain-link fences or nonconductive barriers.

   2. Locking entrances not under constant observation.

   3. Posting warning signs for high voltage that prohibit unauthorized entry.

   4. Maintaining an access list of personnel qualified to enter.

b. Provide for the safe removal of oil spilled during routine maintenance around all outdoor transformers.

c. Make sure that transformers do not contain any traceable amounts of polychlorinated biphenyls (PCBs).

d. Test for PCBs. If you suspect them, take all precautions as if they were present (see Chapter 9.1, "Hazardous materials safety and health," of this handbook). Contact the Safety and Test Operations Division or the Occupational Health Officer for additional information and instructions.

e. Never place liquid-filled transformers indoors without permission from the Center Operations Directorate.

11. Requirements for installing lighting systems

You shall install systems that meet National Fire Protection Association Standard 70.

12. Features to include when designing an emergency lighting or power system

You shall follow National Fire Protection Association Standard 101, National Electric Code Article 700, and the requirements listed below when you design emergency lighting systems:

a. Provide an independent source of energy to light work areas, corridors, tunnels, exits, and stairways during a power failure.

b. Provide a visual alarm system to warn of improper operation.

c. Never use circuits or outlets that power emergency lighting chargers for other lights or appliances.

d. Make sure that emergency lights automatically activate when the primary lighting system fails or during a power failure. A failure of any one component in the emergency system shall never leave any critical space in total darkness.

e. Make sure that emergency power circuits have an emergency supply source to which the load will be switched automatically when the primary source fails.

f. Provide a switch for testing the emergency lighting system. The test switch shall be clearly marked and accessible from the normal working level.

g. Make sure that generators used to supply emergency power are started, brought up to speed and frequency, and put on line as soon as emergency switching operations can be done safely.

13. Requirements for operating emergency power and lighting systems

You shall follow NASA-STD-8719.11 and the requirements listed below:

a. Put multipurpose dry chemical or CO_2 extinguishers next to generators.

b. Store generator fuels in approved containers in a protected location if you shall store reserve fuel for a mobile power source.

c. Refuel generators using approved containers and fuel dispensers.

d. As the immediate supervisor, you shall make sure that:

   1. Servicing, operating, or maintaining of emergency power equipment is performed by qualified and certified personnel.

   2. The maintenance crew is proficient in administrating CPR, familiar with pertinent safety regulations, and supplied with appropriate safety equipment.

e. Use approved plans to do maintenance on emergency lighting and power systems.

f. Have the Electrical Operations Branch, Plant Engineering Division, approve repairs on or modifications to emergency lighting and power systems.

g. Ground portable generators per NPFA 70 Article 250 and manufacturer's instructions.

Requirements for tags and stickers

14. Defective electrical equipment

Remove power from defective electrical equipment immediately. If the equipment could cause personal injury and cannot be repaired immediately, you shall attach WARNING - *DO NOT OPERATE* tags, JSC Form 19A (Appendix 8A). (**Note**: JSC Form 19A is different than JSC Form 1291, the "Danger, Lockout/Tagout (Tag).") Electrical equipment with these defects requires tags for:

a. Poor ground impedance.

b. Energized ground wires.

c. Exposed wiring.

d. Loose receptacle housings.

e. Broken receptacles.

f. Reversed polarity in shop areas.

g. Failure to function unless the cause is known to be nonhazardous.

15. Removing a *DANGER, CAUTION,* and *WARNING* tag or sticker

Normally, only the installer is allowed to remove a danger, caution, or warning tag. However, when defective electrical outlets are repaired, the repair electrician may remove the tag or sticker and **shall notify the person who attached it and the facility manager**.

Requirements for controlling static electricity

16. Preventing hazardous static discharges

You shall bond and ground all systems designed to transfer, store, or handle flammable gases or liquids.

17. Specific design and installation requirements for bonding and grounding these systems

You shall follow the requirements listed below to bond and ground systems mentioned in paragraph 16:

Note: These installations shall be individually engineered to meet the codes for the various products and environmental conditions.

If you are working with . . .	***Then you shall . . .***
Flammable gases or liquids	• Follow the engineering specifications, and all local and national codes. • Use a correctly sized bond or ground wire with adequate strength, corrosion resistance, and flexibility for the service intended. You may use insulated or non-insulated wire. • Follow National Fire Protection Association Standard 77, "Static Electricity," for the design of ground systems unless the NASA design standards are more restrictive.
Storage tanks, equipment, and piping	• Follow the engineering specifications, and all local and national codes. • Ground per the engineering design drawings, which will take into consideration the stored material. • Make sure the resistance of the tank, piping, or equipment to ground meets the design specifications. • Install provisions for grounding all components, including the tank car or tank truck. The system may have to be the alarming type. Check the engineering specifications.
Submerged filling lines	• Follow the engineering specifications, and all local and national codes.
Grounding or bonding connections	• Follow the engineering specifications, and all local and national codes.

18. Specific operational requirements for bonding and grounding temporary storage vessels

You shall ground transport vessels, portable containers, and other types of temporary storage vessels while transferring flammable liquids or gases. Visually check the grounding and bonding system before each transfer operation to make sure that all connections are good and that there is a continuous path to ground. Periodically check the grounding system with the appropriate test equipment.

19. Hazards of static discharges

You could be seriously injured if exposed to the following hazards:

a. An explosion could occur in a flammable atmosphere caused by a spark from a charged object near a ground line or another charged object.

b. A large enough static discharge could set off igniter circuits.

c. Although static electricity is not lethal, your reaction to a shock may be enough to cause you injury or cause you to damage equipment.

Other electrical safety requirements

20. Precautions for reconnecting or restarting critical equipment after an electrical maintenance or a power outage

Check to verify that voltage, phase, polarity, and current-limiting devices (including motor overloads) are correct. Contact Facility Management and the Operations Office for help.

21. Training for working on electrical equipment

You, as an electrician, shall be trained and certified as follows:

a. As described in NFPA 70E, Article 110.

b. To install, maintain, and operate electrical equipment and power lines.

c. Shall also have LO/TO training described in Chapter 8.2 of this handbook.

d. To maintain electrical equipment or work with exposed energized circuits. You shall be fully trained in electrical safe work practices, emergency procedures, first aid, and CPR. This includes periodic refresher training.

e. To work on energized equipment.

f. To work on high-voltage systems. You shall be trained and certified and have a Hazardous Operations Permit.

Note: See Chapters 4.1, "Program description" (for safety and health training), and 5.8, "Hazardous operations: safe practice and certification," of this handbook for more requirements on training and certification.

22. PPE for electrical work

You shall follow these requirements for PPE and use any other PPE identified in a Job Hazard Analysis. See Chapter 5.6, "Personal protective equipment," of this handbook for more requirements on PPE:

For . . .	*You shall . . .*
All PPE	• Inspect PPE before each use to make sure the insulating qualities provide adequate protection.
Electrically insulating rubber equipment	• Use equipment that is classified and marked Class 0-4, and that meets the design requirements of OSHA 29 CFR 1910.137(a), "Electrical Protective Devices." • Inspect and test equipment to meet the requirements of OSHA 29 CFR 1910.137(b).
Safety gloves	• Use gloves designed for electrical work and inspect them for cuts, punctures, or signs of wear before beginning work. • Never use gloves with an insulation rating less than the working voltage. • Wear leather gloves over safety gloves to avoid cutting or tearing them. • Make sure that the gloves have been inspected and tested at least every 6 months as described in OSHA 29 CFR 1910.137(b).
Lineman's spurs	• Use spurs that are at least 1¼-inch long. • Make sure that they have safety covers to cover the gaffs when not in use.
Safety belts	• Use belts for climbing over 4 feet above the ground (see Chapter 5.6 for specific requirements).
Ladders	• Use nonconductive ladders that meet OSHA 29 CFR 1910.25, "Portable Wood Ladders," OSHA 29 CFR 1910.268(H), OSHA 29 CFR 1910.269-1(H), and ANSI standards if doing maintenance on or near electrical equipment (see Chapter 5.7, "Ladders, scaffolds, and elevated platforms: how to work with them safely," of this handbook for specific requirements).
Working on energized systems.	Refer to National Fire Protection Association Standard 70E, Article 130 for the requirements.

23. Electrical emergencies

You shall take the following actions for these emergency situations:

a. For ***electrical shock*** you shall:

1. Call for help, using the emergency phone numbers or using a two-way radio.

2. Switch the power off.

3. Administer first aid and, if necessary, CPR.

4. Do not attempt to separate the energized circuit from the victim.

b. For a ***fire*** you shall:

1. Evacuate the area.

2. Call for help, using the emergency phone numbers or using a two-way radio.

3. Use a CO_2 or multipurpose dry chemical extinguisher to fight **only the incipient** fire, and only if you are trained to use an extinguisher properly. See Chapter 3.8, "Emergency preparedness," of this handbook.

Remember your emergency number: x33333 at JSC, Sonny Carter Training Facility, and Ellington Field, 911 at any off-site location, and x5911 at WSTF. **Cell phone number: 281-483-3333.**

24. Responsibilities

a. As an ***electrical supervisor***, you are responsible for making sure that:

1. An LO/TO program is in place and **is being used correctly.**

2. All electrically powered tools are in good working condition.

3. All safety devices are available, maintained, and properly used.

4. All assigned personnel follow safety requirements.

5. **Electrical work is done by employees trained and certified for the task or the employees are** under the direct supervision of a **trained and certified** person.

b. The ***Safety and Test Operations Division*** is responsible for auditing JSC's electrical safety program as described in subparagraph 3.f of this chapter.

Chapter 8.2
Lockout/tagout practices

This could be you . . .

An electrician received a shock from a 480-volt alternating current source while modifying a motor controls panel. The hot junction was an undocumented change to the panel. The electrician could have been electrocuted but only suffered injury since the current passed through the arm only.

An operator failed to turn off and lockout a pipe-cutting machine after it stalled. He lost a finger as a result because he touched the chain and sprocket drive when the machine unexpectedly restarted.

Employees who were not certified to service or operate a crane violated a Do Not Operate tag and operated the crane. They damaged highly valued equipment.

1. Applicability of this chapter

You are required to follow this chapter if you work at JSC, including Ellington Field or Sonny Carter Training Facility, whether a civil service or contactor employee. If you work at a JSC field site, follow local requirements that meet the intent of this chapter. Specific categories of employees under this chapter are:

a. ***Authorized employee***: A person who locks out or tags out machines or equipment to service or maintain those machines or that equipment.

b. ***Affected employee***: An employee whose job requires him or her to operate or use a machine or equipment that is being serviced or maintained under lockout/ tagout, or whose job requires him or her to work in an area in which the servicing is being done. An affected employee becomes an authorized employee when the employee's duties include servicing or maintenance covered under LO/TO.

c. ***Other employee***: An employee whose work operations actually is, or potentially may be, in an area during the period when energy control procedures will be used.

d. ***Task Group Representative (TGR)***: A person who is responsible for the identification and locking/tagging of the energy isolation points during group LO/TO.

2. JSC's LO/TO program

This chapter is JSC's LO/TO standard, which designed to implement compliance at JSC with 29 CFR 1910.147, "The Control of Hazardous Energy (Lockout/Tagout)." It provides a consistent and uniform policy and *minimum* requirements for locking out and tagging out energy-isolating devices during maintenance, service, or repairs on machinery, equipment, or systems. The intent of this chapter is to ensure that machines, equipment, and/or systems are

properly and uniformly locked out and tagged out throughout JSC, and that ***ALL*** employees are protected from exposure to an unexpected energy release. The following requirements apply:

a. Each project, contractor, or organization may take this basic LO/TO standard and add addendums to meet their particular operations and procedures, as long as the intent of the standard is met or exceeded, followed by all employees, and strictly enforced.

b. Projects, contractors, and organizations shall develop, document, and use procedures for controlling potentially hazardous energy unless specifically exempted under 29 CFR 1910.147(c)(4)(i). These procedures are required to meet the requirements in this chapter and clearly and specifically outline the scope, purpose, authorization, rules, and techniques that you will use for controlling hazardous energy, and the means to enforce compliance including, but not limited to, the following:

   1. A specific statement of the intended use of the procedure.
   2. Specific procedural steps for shutting down, isolating, blocking, and securing machines or equipment to control hazardous energy.
   3. Specific procedural steps for placing, removing, and transferring LO/TO devices or tagout devices and the responsibility for them.
   4. Specific requirements for testing a machine or equipment to verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

3. Other special conditions

This chapter does not apply to the following:

a. Work on cord- and plug-connected electrical equipment where the hazard of unexpected energizing or start up of the equipment is controlled by meeting both of the following conditions:

   1. Unplugging the equipment from the energy source.
   2. Keeping the plug under the exclusive control of the employee performing the servicing or maintenance. At no time should servicing or maintenance be performed while the equipment is plugged in. You may troubleshoot electronic circuits if you have an approved safe procedure and follow the requirements in chapter 8.1, "Electrical Safety.

b. Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water, or petroleum products on pressurized pipelines, provided that the project, contractor, or organization demonstrates that all of the following are true:

   1. Continuity of service is essential.
   2. Shutdown of the system is impractical.
   3. Documented procedures were followed and special equipment was used to provide proven effective protection for employees.

c. Operation control of equipment when lockout/tagout is not required, but control is needed to prevent damage or for other operational issues. This is covered in attachment 8.2B, appendix 8B, "Operational Control."

4. Contractors

There are exceptions to LO/TO requirements for work done at JSC facilities. The following requirements apply:

a. If you contract or sub-contact for services, you are responsible for notifying contractors or subcontractors of this requirement, and shall provide a copy of this chapter to the contractor or subcontractor.

b. All contractors shall make sure that their employees understand and follow this JSC LO/TO standard.

Requirements and procedures for Lockout/Tagout

5. General requirements and enforcement

The following requirements apply to all employees, machines, and equipment at JSC:

a. If you see a piece of equipment that is locked out or tagged out, you **shall never** attempt to start, energize, or use that machine or equipment except as required to verify isolation in subparagraph 6.g. below.

b. If you are an "authorized employee," you shall follow the steps listed below when locking out or tagging out a component or system.

c. If you violate LO/TO, you are subject to disciplinary measures by your employer as described in Chapter 3.7, "Disciplinary System," of this handbook.

d. When installing new machines or equipment, or when replacing, doing major repairs on, renovating, or modifying existing machines or equipment, you shall design the energy-isolating devices to accept a lockout device.

6. JSC's basic LO/TO requirements

You shall follow these steps when maintaining, servicing, or repairing equipment:

a. Prepare for shutdown. Determine the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means by which to control the energy.

b. Notify "affected employees" who operate the equipment that you will be working on.

c. Shut down equipment using procedures established for that machine or equipment.

d. Isolate all energy sources.

e. Attach LO/TO isolation devices as described in paragraphs 7 and 8 below. Also note the

requirements for group lockout and shift changes in paragraphs 12 and 13 below.

f. Release all potential or stored energy, as described in paragraph 9 below.

g. Verify the isolation, including testing; see paragraph 10.

h. Service, repair, or maintain the equipment.

i. Inspect the work to ensure that all nonessential items have been removed and that machine or equipment components are operationally intact. Make sure that all employees have been safely positioned and are not in the operational area before re-energizing the equipment.

j. Notify "affected employees" that lockout or tagout devices will be removed.

k. Remove LO/TO isolation devices as described in paragraph 11 below.

l. Restore the equipment to operation.

Note: If the equipment you will be working on has another lock or tag, such as the "WARNING" DO NOT OPERATE tag, or another employee's lock and tag, you still need to lockout and tagout the equipment per this chapter before you work on it. This will include evaluating the situation to determine if your lockout/tagout devices can be applied in addition to the lock or tag or whether you must have the other lock or tag removed. Revise your lockout/tagout procedure as needed.

7. Hardware (locks and lockout devices)

Attaching locks, tags, and other necessary hardware will ensure that the energy isolation device cannot be inadvertently switched or changed during maintenance or repair activities. To get locks for lockout, follow the "Policy on issuing locks and tags" in Attachment 8.2B, Appendix 8B. The following requirements apply to locks and lockout devices:

a. ***Locks.*** **You shall only use locks provided by JSC for isolating, securing, or locking equipment from all potential energy sources.** Dedicated lockout padlocks at JSC are "RED" in color and individually keyed and numbered. Never use a RED lock for any other purpose. Orange locks with RED shrink wrap shall designate High Voltage lockout/tagout by the Center Operations Directorate.

b. ***Other lockout devices.*** These include, but are not limited to, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware for isolating, securing, or blocking of machines or equipment from energy sources. Your company or organization will provide these devices. They shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal-cutting tools.

8. LO/TO tags

If you are going to personally work on a system, you shall only use the red LO/TO form (JSC Form JF 1291) and attach them by putting the lockout through the grommet or by

using a nylon cable ties provided by JSC. To get tagout tags, follow the "Policy on issuing locks and tags" in Attachment 8.2B, Appendix 8B. The following requirements apply to tags:

a. Tags are essentially **informational devices** attached to the lockout devices. Tags do not provide the physical restraint provided by a lock. If you use a tag without a lockout device, you shall also use other methods to isolate all sources of energy such as block and bleed, blinds, valve hand-wheel removal, etc.

b. You shall demonstrate that these other methods are at least as effective as a lockout device would have been, if it were used. This demonstration shall meet all tagout provisions of 29 CFR 1910.147, and specifically paragraph 147(c)(3)(ii).

c. If an energy-isolating device is not capable of being locked out, you shall use a tagout device instead.

d. You shall also use all reasonable means to make sure that the energy-isolating device is not operated.

e. When a tag is attached for energy isolation, no one may remove it without the authorization of the person responsible for the tag. It shall never be bypassed, ignored, or otherwise defeated. Never energize the system when a tag is in place except under specific conditions per written procedure outlined in this chapter (testing system to ensure that there is no power, etc.).

f. You shall attach tags either to the padlock or to the same point as the padlock.

g. For energy-isolating devices that are not capable of being locked out, you shall attach the tag to the device or as close as safely possible to the device and in a position that will be immediately obvious to anyone attempting to operate the device.

h. Tag information shall be legible and understandable.

i. You shall never use the red LOCKOUT TAGOUT tag as a WARNING, DO NOT OPERATE tag. The Danger, LOCKOUT TAGOUT (JF 1291) tag means one thing and one thing only: that you are personally working on the system.

j. JSC tags contain log and tag number spaces, which you may use as best fits to your needs, but you shall address the log and tag numbers in any LO/TO procedures you develop.

9. Releasing stored energy

After attaching lockout or tagout devices to energy isolating devices, you shall relieve, disconnect, restrain, and render safe all potentially hazardous stored or residual energy. Stored or residual energy could include, but is not limited to electrical capacitors, batteries, contained hydraulic or pneumatic pressure, springs, and suspended weights. If the stored energy could re-accumulate to a hazardous level, continue to verify isolation until the servicing or maintenance is completed, or until the possibility of the energy accumulation no longer exists.

10. Verifying isolation

Before starting work on the machinery, equipment, or system that has been locked out or tagged out, you, as an authorized employee, shall verify that the equipment has been isolated and de-energized by the following:

a. Verify that personnel are not exposed to potential danger.

b. "Test" the isolation of the equipment by ***attempting to energize it, using the normal operating controls*** (where possible) to make certain that the machinery, equipment, or system will not operate.

c. Verify, using the appropriate equipment, that previously energized parts that are exposed are free of energy before removing electrical PPE or exposing any unprotected persons. If the circuit to be tested is over 600 volts, test the test equipment used for proper operation immediately after the test.

d. Verify on a gauge, open a vent valve, or use other positive verification methods, if pressure sources are involved.

Caution: Return operating controls to neutral or off position after attempting to start.

11. LO/TO lock release or removal

Only one key is authorized for each red LO/TO lock and LO/TO tag and *only* the person who attached the lock is authorized to remove the lock and maintain custody of the key. The TGR is the only person who is authorized to release and remove the LO/TO lock and tag from his or her assigned group lock box. There is a ***special condition to this rule***: If the employee who attached the red LO/TO lock and LO/TO tag is not at the facility and is unavailable to remove the lock, the trained supervisor is authorized to remove the lock after following the procedure below. If you need a red LO/TO lock removed, you shall contact the employee's supervisor. If you, as a supervisor, are asked to remove a red LO/TO lock with a LO/TO tag, you shall develop a procedure that includes these steps and others pertinent to your organization or the specific situation:

a. Confirm that the employee who attached the lock is not at the facility and not available to remove the lock.

b. Attempt to contact the employee. Call home phone, cell phone, or pager. Document all attempts to contact the employee.

c. Make sure all work is completed and that no employees are exposed to any type of hazards created by removing the LO/TO device(s).

d. Notify all affected employees that you will be removing the lock.

e. Have an authorized employee test and visually inspect the equipment, as necessary, to verify that all tools, electrical jumpers, shorts, grounds, and other such devices have been removed so that the circuits and equipment can be safely energized.

f. Remove the lock. Avoid destroying the lock if possible by cutting the chain, hasp, or

other restraining device.

g. Immediately inform the authorized employee whose lock you removed that the lock has been removed when he or she returns to the facility or becomes available, ***and before*** he or she returns to the task or system where the lockout was in effect. You may need to notify coworkers, leave a phone voice message, an email, or use other means to notify him or her to report to you **before** going to the task or system where the lockout was in effect. You message shall say that their lock has been removed and the system is now live or dangerous if work is resumed.

h. Return an undamaged lock to the employee with an explanation of circumstances as soon as possible.

12. Group lockout

An LO/TO application may involve more than one maintenance, repair, or servicing employee or more than one point of energy isolation. Several options exist for "group" LO/TO procedures. The examples in subparagraphs c–f below for group LO/TO illustrate the range of approaches. These examples are not intended to represent the only acceptable procedures for group LO/TO. The primary requirement is that the process used shall provide the employee protection equivalent to using a personal LO/TO. This would include use of "controlled key locks" and LO/TO tags per a written procedure for the task. The following requirements apply:

a. The group or supervisor shall designate a TGR for any group LO/TO to maintain control of the group lock box during the entire duration of the maintenance or service task. Specific responsibilities for the TGR are found in 29 CFR 1910.147(f)(3)(ii).

b. An important element of "group LO/TO" is to enable the TGR to initially lockout and tagout the system and place all LO/TO keys and tag tabs in a group lockbox. Then the TGR hangs an LO/TO tag with a red LO/TO lock on the lock box. The TGR controls the key while he or she is working the task. Each authorized person shall install his or her individual red LO/TO lock and LO/TO tag on the lockbox.

c. The energy isolation devices shall never be released until all authorized personnel and the TGR have removed all locks and tags from the lockbox. The TGR is responsible for control of the lock box and key. The control responsibility of the TGR may be transferred between shift changes and job reassignments.

d. Single energy source, multiple maintenance, servicing personnel, and ***single point with use of multi-lock adapter (figure 8.2-1)***:

   1. If the equipment operation is the responsibility of a system owner or user, that individual may configure the equipment for operational control before the group applies any tag or lock. (see Appendix 8B attachment 8.2B)

   2. Each authorized person who will be performing the maintenance or service task shall install individual red LO/TO lock and LO/TO tag at the de-energized single-energy control point before starting work. This will often require the use of a multi-lock

adapter to accommodate the numerous locks.

3. If energy isolation is required during periods where the work area may be unattended by authorized personnel, a TGR installs a separate red LO/TO tag and red LO/TO lock at the single-energy control point at the time of isolation. The TGR shall maintain control of the key throughout the maintenance or service task period.

e. Single energy source, multiple maintenance, servicing personnel, and ***single point with use of lockbox***:

1. An alternate approach is to use a lockbox when the number of locks and tags are too numerous to be supported by the single energy control point.
2. If the equipment operation is the responsibility of a system owner or user, that individual may configure the equipment for operation controlbefore the group applies any tags or locks. (see Appendix 8B, attachment 8.2B)
3. The TGR shall attach a red LO/TO tag marked or stamped with the words "for group LO/TO" and a red LO/TO lock at the de-energized single energy control point at the time of isolation. The key is then placed in the lockbox.
4. The TGR shall install a red LO/TO tag and a red LO/TO lock on the lockbox.
5. The TGR shall maintain control of the key throughout the maintenance or service task period until all work is completed and the equipment is safe to reactivate. This provides energy isolation during periods where the work area may be unattended by authorized personnel.
6. The authorized personnel who will be performing the maintenance or service task shall each install individual red LO/TO lock and LO/TO tag on the lockbox before working.

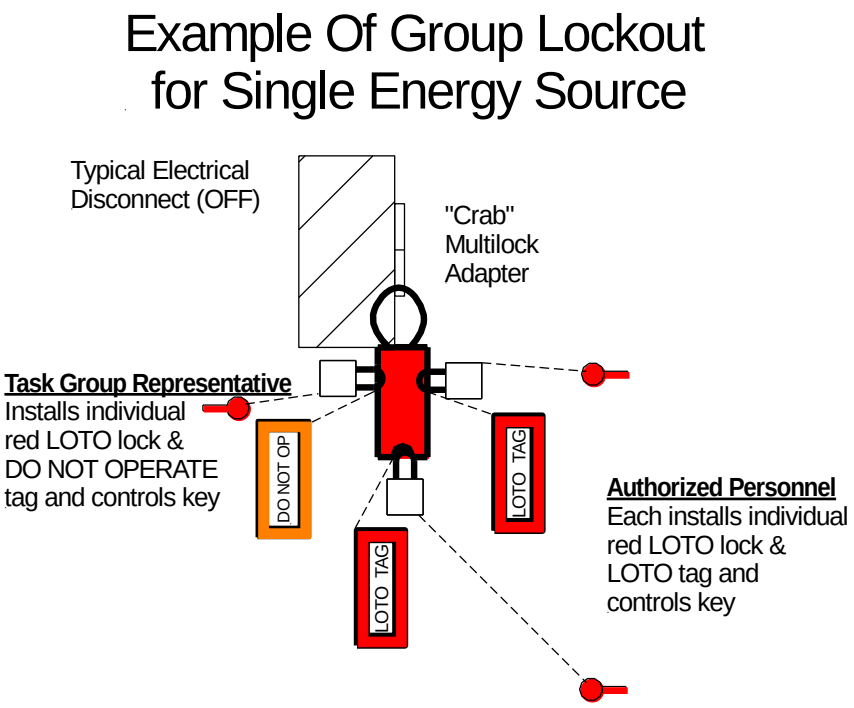

Figure 8.2-1. Group lockout tagout concept for single energy control point.

f. Multiple energy sources, multiple maintenance, servicing personnel, and ***multiple point sources using lockbox (figure 8.2-2)***:

1. An alternate approach is to use a lockbox when there are multiple energy control points. in this case, a system owner or user may have applied other tags and locks for operational control per attachment 8.2B, appendix 8B. The group would apply its devices in addition to the other locks or tags.
2. The TGR shall attach a red LO/TO tag marked or stamped with the works “for group LO/TO” and a red LO/TO lock at each energy control point at the time of isolation. The keys are then placed in the lockbox.
3. The TGR shall install a red LO/TO tag marked or stamped with the words “for group LO/TO” and a red LO/TO lock on the lockbox.
4. The TGR shall maintain control of the key throughout the maintenance or service task period until all work is completed and the equipment is safe to reactivate. This provides energy isolation during periods where the work area may be unattended by authorized personnel.
5. The authorized personnel who will be performing the maintenance or service task shall each install individual red LO/TO lock and LO/TO tag on the lockbox before working. This option requires the least number of locks and ensures that each person has control of the total system when he or she is working on the system.

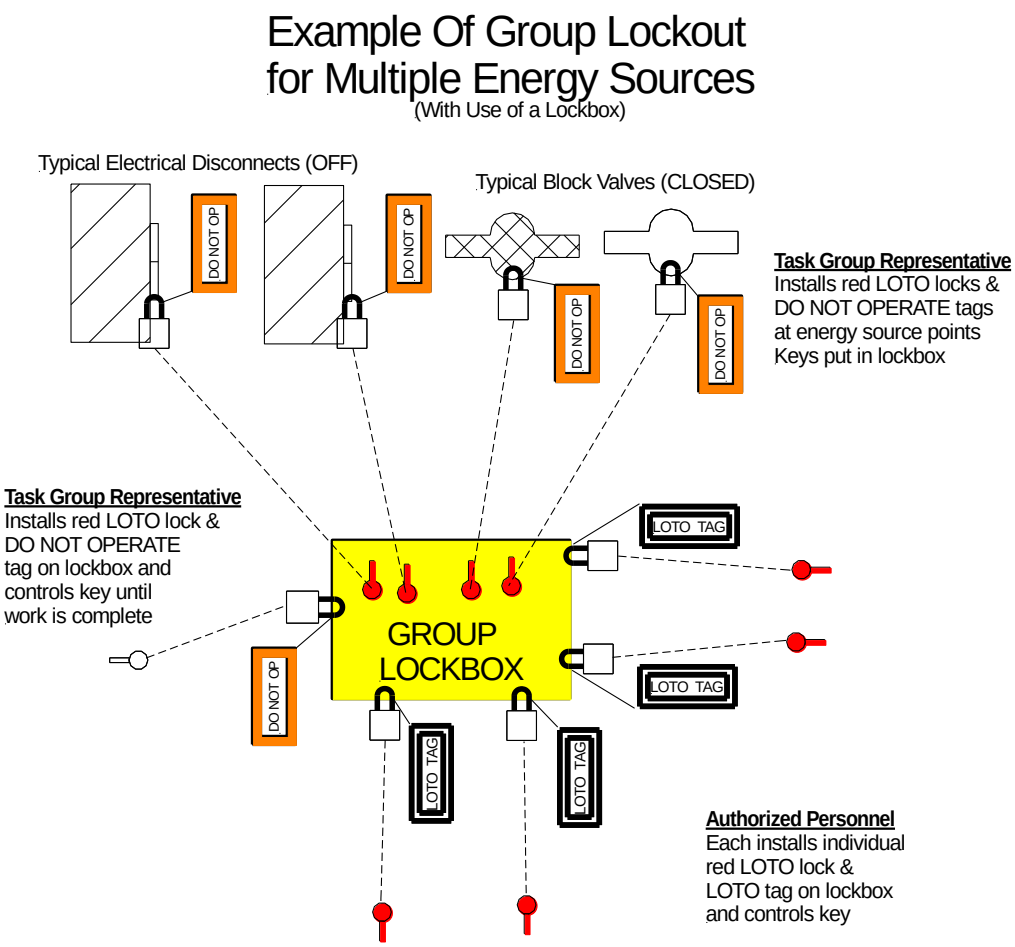

Figure 8.2-2. Group LO/TO multiple energy source control points.

g. Multiple energy sources, multiple maintenance, servicing personnel, and ***multiple point sources using multi-lock adapters***:

   1. If the equipment operation is the responsibility of a system operator or user, the user or operator may have to use other tags for operational control (such as the "Do Not Operate tag") with appropriate shop or craft locks, per attachment 8.2B, appendix 8B.

   2. Each authorized person who will be performing the maintenance or service task shall install individual red LO/TO lock and LO/TO tag at each of the multiple energy control points before starting work. To accommodate multiple objectives, this will often require the use of a multi-lock adapter to accommodate the numerous locks.

   3. The TGR shall attach a red LO/TO tag marked or stamped with the words "for group LO/TO" and a red LO/TO lock at each energy control point at the time of isolation. This provides ongoing, uninterrupted lockout during periods where the work area may be unattended by authorized personnel.

4. The TGR shall maintain control of the keys throughout the maintenance or service task period.

13. LO/TO during shift changes

During the course of work, work crews or individuals may take turns working on the locked out equipment. The following requirements apply:

a. If a new authorized person or crew of authorized persons carries on the work started by an earlier person or crew, there are two options:

   1. Arriving employees attach their own locks and verify energy isolation, and departing employees remove their locks, or

   2. Each departing employee transfers his or her key to an arriving employee, so that each arriving employee has a key and corresponding lock.

b. Each authorized person shall use his or her own red LO/TO lock. When multiple shifts work on a locked out system, the TGR will be responsible for making sure that all authorized personnel have either installed individual red LO/TO locks and tags at all energy sources or the appropriate group lockbox.

c. Arriving employees shall verify energy isolation.

d. When a system must be handed over to a new crew to continue the work and there is equipment already locked and tagged out, this constitutes a shift change and you shall follow these steps:

   1. Inform the arriving shift or crew of the devices, hazards, and other employees that are involved in this particular lockout/ tagout operation.

   2. The employees on arriving shift or crew attach their lockout and tagout devices on the isolation device(s) that are currently locked and tagged or receive keys form the departing employees.

   3. The employees on the departing shift remove their lockout and tagout devices, or transfer keys to the arriving employees.

   4. The TGR for the departing group will be the last person of the departing group to remove his or her lock or transfer a key; this ensures energy isolation at all times until the new TGR is ready to accept the responsibility. If they opt for lock changeout, the arriving TGR will be the first person of the arriving group to attach his or her lock prior to or immediately after the previous TGR removed his or her lock. Both TGRs will witness the transfer of energy isolation control and note the transfer in the task documentation.

   5. The current TGR shall verify energy isolation for the system.

e. When LO/TO is to be handed over from one TGR to another while the work is continued by the same authorized employees, this does not constitute a shift change. However, the task documentation shall be annotated to document this transfer of energy isolation

control.

1. Inform all authorized personnel working on the system of the impending transfer of LO/TO authority.
2. The departing TGR will remove his or her lock and the new TGR will attach his or her lock prior to the previous TGR removing his or her lock or the TGRs transfer the key. Both TGRs will witness the transfer and note the transfer in task documentation.

Training and Audits

14. Training for LO/TO

A competent person shall conduct LO/TO training and the training needs to follow the requirements of Chapter 4.1 of this handbook for conduct and documentation.

a. ***Initial training.*** Each employee involved in LO/TO or energy control as described in the bullets below shall be trained in the purpose and scope of the LO/TO program, recognizing hazardous energy sources and the methods and means necessary for energy isolation, and using the LO/TO procedures. Training for the three types of employees (***authorized***, ***affected***, ***other,*** and ***supervisor***) is based on the relationship of that employee's job to the equipment being locked out or tagged out as follows:

   1. *If you are an* **authorized employee** *(you LO/TO and service or maintain equipment), your training shall cover details about the type and magnitude of the hazardous energy sources present in the workplace and the methods and means necessary to isolate and control energy sources.*
   2. If you are an ***affected*** or ***other employee*** (you operate or use the machines), your training shall cover: recognizing when the control procedure is in place, understanding the purpose of the procedure, and understanding the importance of not attempting to start up or use equipment that has been locked out or tagged out.
   3. If you are a ***supervisor*** over authorized employees, you shall be trained as an authorized employee and trained in the procedure for removing lockout/tagout devices in paragraph 11 above.

b. ***New-hire training.*** If you are a new employee, you shall attend LO/TO training before doing any tasks that could expose you to energy hazards. Your supervisor shall tell you if you require LO/TO training when you are first assigned to work.

c. ***Retraining***. As an authorized employee, you require retraining at least every 2 years or as required in 29 CFR 1910.147 **1910.147(c)(7)(iii)**.

d. ***Certification of training***. *Supervisors shall certify employee training records (see chapter 4.1, paragraph 10) as required by 29 CFR 1910.147(c)(7)(iv).*

15. Periodic audits of JSC's LO/TO program

Each organization or contractor is responsible for continually monitoring and periodically auditing (at least annually) its LO/TO and energy control programs. The following requirements apply:

a. The audit shall follow the requirements of 29 CFR 1910.147 (c) (6) and be documented.

b. The Safety and Test Operations Division shall audit JSC's LO/TO program at least annually by inspecting organization and contractor documentation to ensure that all effected employees understand and are following the program.

c. The Responsible Account Executive shall review any deviations noted on the audit and forward them to the responsible organization or contractor for correction.

Appendix 8B

Miscellaneous guidelines and instructions

This appendix contains the following attachments:

8.2A Policy for issuing locks and tags

8.2B Operational Control

Attachment 8.2A
Policy for issuing locks and tags

1. Policy and procedures

This attachment is JSC's policy issuing LO/TO locks, LO/TO tags and operational control tags, which will be called "equipment." Issuing LO/TO equipment will be as follows:

a. The JSC LO/TO center issuer (LO/TO-CI) issues the equipment. The JSC LO/TO-CI is provided by the Safety and Test Operations Division, mail code NS. The LO/TO-CI will issue equipment to designated contractor safety representatives or their designee (such as a shift supervisor), whose organization conducts LO/TO operations at JSC, Ellington Field, or the Sonny Carter Training Facility.

b. As a designated contractor safety representative, you must submit the normal request for LO/TO equipment to the LO/TO-CI for the amount of equipment that you expect your organization would normally need to conduct LO/TO operations. Request forms are available from the LO/TO-CI. The LO/TO-CI will process requests during daytime work hours.

c. The LO/TO-CI will issue equipment to the contractor requestor and maintain a record of the equipment issued. If additional equipment is needed by the contractor after normal work hours (i.e., nights, weekends, or holidays), you—as a contractor safety representative—or your designee (shift supervisor) can get equipment on an emergency basis from the on-duty Fire Protection Specialist (temporary center issuer) at Building 25. If the on-duty Fire Protection Specialist is not available at Building 25, you will find a telephone number (security dispatcher) and instructions on the LO/TO equipment storage locker to contact the Fire Protection Specialist, who will return to the site and issue the equipment.

d. Ellington Field and Sonny Carter Training Facility will also have an inventory of equipment available during normal work hours. As the designated contractor safety representative, you must maintain the inventory and be responsible for issuing equipment during normal hours for scheduled LO/TO work including work scheduled for non-normal hours. If emergency work or work not previously scheduled requires additional equipment, you or your designee must get additional equipment from the Fire Protection Specialist (temporary center issuer) at JSC.

2. Responsibilities

a. The ***LO/TO-CI*** is responsible for:

- Submitting purchase orders for LO/TO equipment as needed to maintain a working inventory.
- Issuing LO/TO locks, LO/TO tags, and operational control tags (equipment) during normal work hours and making provisions for issuing LO/TO devices outside of normal working hours and on an emergency basis.
- Maintaining a record of the equipment issued.

- Making sure an adequate amount of replacement equipment is available at JSC, Ellington Field, and Sonny Carter Training Facility by contacting the designated safety representatives periodically.

b. As a ***Designated Safety Representative***, you are responsible for:

- Determining the realistic amount of LO/TO equipment that your organization will need.
- Obtaining the determined amount of equipment from the LO/TO-CI and issuing it as needed to your organization involved in LO/TO operations. Whenever possible, contact the LO/TO-CI in advance to ensure that an adequate supply of equipment will be on hand to meet your request, and request your replacement equipment as needed from the LO/TO-CI.
- Supporting JSC annual inventories and periodic audits of the JSC LO/TO program as required by JSC implementation of 29 CFR 1910.147.

Attachment 8.2B
Operational Control

1. JSC's operational control program

This Attachment is JSC's operational control program to safely control configuration or other operations when lockout/tagout is not required. It provides a consistent and uniform policy and minimum requirements for safe operational control of machinery, equipment, or systems to prevent damage from inadvertent activation. The procedure in this Attachment ensures that machines, equipment and or systems are, as a minimum, properly and uniformly tagged out throughout JSC.

If you work within the boundaries of JSC, you must follow this JSC basic operational control program. All employers working at JSC must follow this basic JSC program and use the procedure for attaching Warning, Do Not Operate Tags, to energy-isolating devices. This is to prevent unexpected energization, startup, or release of stored energy to the machinery, equipment, or systems.

Each project, contractor, or organization may take this basic policy and add addendums, as long as the intent of the basic policy is met or exceeded, followed by all employees and strictly enforced.

2. General requirements and enforcement

The following requirements apply to all employees at JSC. If you:

a. See a piece of equipment that is tagged out, you **must never** attempt to start, energize or use that machine, equipment or system.

b. Are responsible for configuring equipment, you must follow the procedures listed below when tagging out.

c. Violate these procedures, you are subject to disciplinary measures by your employer as described in Chapter 3.7, "Disciplinary system," of this Handbook.

3. JSC's basic tagout procedure

You must follow these steps when tagging out equipment for purposes other than maintaining, servicing, or repairing equipment:

a. Notify "affected employees" who operate or use the machinery, equipment, or system.

b. Attach tagout tags to the isolation devices for the necessary time. You are also encouraged to use craft or shop locks per your organizations' policy for extra security. However, you must never use a red lockout/tagout lock for operational control.

c. Isolate an energy source with the isolation device.

d. Remove tagout tags from the isolation devices.

e. Restore the machinery, equipment, or system to operation.

f. Notify "affected employees."

4. Tags

You must only use tagout tags (JSC form 19A, WARNING, DO NOT OPERATE tag) and attach them with nylon cable ties, for operational control.

Tags are essentially **Warning Devices** attached to energy-isolation devices or lockout devices, but provide no physical restraint as would be provided by a lock.

a. When a tag is attached to an energy-isolation device for operational control purposes, other than maintenance or repair activities (lockout/tagout), no one may remove it without authorization of the person responsible for the tag or authorization from a supervisor. It also must never be bypassed, ignored or otherwise defeated.

b. The employee who removes the tag must ensure any control records are updated to record the tag removal and restoration of service.

c. Tag information must be legible and understandable.

d. You must only use **JSC Form 19A for Operational Control.** Never use JSC Form 19A, WARNING, DO NOT OPERATE, as a DANGER, LOCKOUT TAGOUT, tag.

5. Tag removal

Preferably the employee who applied the tag should be the one to remove the tag, but if not practical, the employee's supervisor is authorized to assign someone to remove the tag when required. Periodically review tags in the area to ensure they are still needed.

6. Training for operational control

If you are involved in operational control, you must have lockout/tagout training as described in Paragraph 12 of Chapter 8.2 of this Handbook.

8. Periodic audits of JSC's operational control program

The operational control program will be audited with the lockout/tagout program as described in Paragraph 13 of Chapter 8.2 of this Handbook.

Chapter 9.2
Hazard communication

This could be you . . .

A laboratory worker spilled an unknown chemical and the facility was evacuated, causing lost work time for several employees.

An employee was exposed to a hazardous material. The MSDS wasn't immediately available for hazard information, causing medical treatment to be delayed.

1. Applicability of this chapter

You are required to follow this chapter if you work at JSC or a JSC field site. You are required to follow this chapter if you store, use, or dispose of hazardous materials at JSC. If you work at WSTF, follow WSTF requirements that meet the intent of this chapter.

2. What this chapter covers

This chapter is JSC's written hazard communication program to meet OSHA 29 CFR 1910.1200, "Hazard Communication Standard." This standard requires JSC to inform workers of the hazards of the materials that they work with or exist in their work areas.

Determining hazards

3. How JSC uses supplier information to determine hazards

JSC rarely makes hazardous materials. We rely almost entirely on MSDSs from manufacturers and suppliers and give them a unique JSC MSDS number. JSC organizations complete hazard assessments as necessary to identify and control risks. Supervisors shall provide information on any new hazards to their employees through training, instructions, safety alerts, etc.

4. Assessing the hazards of hazardous materials

JSC determines hazards through hazard assessments using system safety techniques as described in Chapter 2.4, "Hazard analysis."

You shall follow these guidelines for hazard assessments for the purpose of this written program:

a. Classify all hazards as physical or health hazards (see definition in the Glossary).

b. Use, as baselines, any technical information from the supplier including MSDSs and any pertinent information from the sources in 29 CFR 1910.1200.

c. If an MSDS does not exist, consider any scientifically valid study that supports its classification as hazardous or establishes materials as being nonhazardous.

5. Reporting additional hazards you identify with hazardous materials

When you identify a hazard that isn't in the MSDS, you shall submit a report detailing the hazard in question, the source of the information, an analysis of potential impacts, and what you recommend to reduce risk. Also, include any specific information that may refute your hazard determination. When you have conflicting information, attempt to compare the technical merits. Your management may submit the report without a conclusion to the following organizations within 30 days of completing the hazard assessment:

a. Clinical Services Branch

b. Safety and Test Operations Division

6. Mixing hazardous materials

When you mix "as-received" hazardous materials with other materials for later use, you shall do a hazard assessment as described in paragraph 4 of this chapter to assess the possible hazards of the mixtures.

7. Assessing the hazards of a mixture

You may test the mixture as a whole to determine its hazardous characteristics. You need to base all hazard assessments on positive data that either establish or refute the mixture as hazardous. You shall follow these requirements:

a. If you don't test the mixture as a whole, you shall:

   1. Assume that the mixture has the same health hazards as its hazardous components present in concentrations greater than 1.0% by weight or volume for non-carcinogens.

   2. Assume that the mixture has the same health hazards as its hazardous components present in concentrations greater than 0.1% by weight or volume for known or suspected carcinogens. You shall still identify known reaction products that are not present in the original components.

   3. Use relevant and scientifically valid data in place of testing to support any assessment of the physical hazards of the mixture.

   4. Indicate, in the hazard assessment, the lack of this information.

b. You shall document the results of the hazard assessment so you can later share it with all potential users. If you create the mixture, you are responsible for a complete and accurate hazard assessment.

c. The Clinical Services Branch, the JSC Environmental Office, and the Safety and Test Operations Division shall review and approve initial shipments and accompanying documentation of such hazardous materials.

d. You shall provide the percentage of each component in the mixture and an MSDS for each component with each shipment.

e. You shall assume that the mixture poses the same hazards as each component, regardless of any prior or existing hazard assessments or test results, if someone using the mixture could be exposed to concentrations of any hazardous component above the OSHA- or ACGIH-permissible exposure limits.

8. Investigating and studying material exposures

The Clinical Services Branch shall conduct investigations and studies of material exposures you need in your work area. This includes sampling the concentration in the atmosphere to determine employee exposure levels.

Hazardous materials inventory

9. Why JSC needs a hazardous materials inventory

The JSC Hazardous Materials Inventory allows for periodic review of all hazardous materials on site. The JSC Hazardous Materials Inventory meets the similar requirements of both EPA Superfund Amendments and Reauthorization Act (SARA) and the OSHA Hazard Communication Standard. The Clinical Services Branch maintains JSC's inventory with inputs from the organizations.

10. How to use the hazardous materials inventory

This inventory reflects the hazardous materials in your work area. The following requirements apply:

a. All employees in your work area shall have access to the inventory. You may use the inventory as a guide to make sure that all MSDSs you need are available.

b. You shall keep the hazardous materials inventory at specific worksites in accordance with directorate instructions.

c. Someone in your area shall be responsible for updating the inventory whenever you get a new product, when you remove an old product, or when there is a significant change in the quantity of the product.

d. You shall enter new materials into the inventory when you first receive them.

11. Contents of a hazardous materials inventory

The following requirements apply to your inventory:

a. Your inventory shall include, as a minimum, the identity of the materials, as written on the label; the JSC MSDS numbers; the location of the materials; the amount usually kept on hand; the largest amount ever present in the workplace; and the quantity used annually.

b. You shall specify the locations in enough detail to allow someone to find the materials quickly.

c. If you run out of materials meant for replenishment, they shall remain on the inventory.

d. If you don't anticipate replacing them, you shall remove the materials from the inventory before the next annual update.

e. The inventory shall include all hazardous materials under the control of your area.

12. What you should do if you are responsible for entering your area's items into the inventory

Each area needs to have someone responsible for evaluating the hazardous materials inventory for that location. If you are responsible for maintaining hazardous materials inventory for your work area, you shall:

a. Contact the Clinical Services Department to get a user code and password for your inventory.

b. Enter all items into the on-line inventory available on the Health Homepage.

c. Continue to list on the inventory any materials you run out of but plan to replenish or continue to use. Delete items no longer in stock that you no longer plan to use.

d. If a material has not been used during the past year, you should consider excessing the item.

e. Get JSC MSDS numbers for all items and record the numbers in your inventory.

f. Review and correct the inventory at least yearly or whenever quantities or locations change significantly. Some products require quarterly updates.

g. Compare incoming materials with the hazardous materials inventory to screen for new chemicals.

Note: You can find additional directions for updating the hazardous materials database in the HazMat Inventory Users' Guide located at: http://sd.jsc.nasa.gov/omoh/scripts/OccupationalHealth/MSDS.aspx.

13. Access to the inventory

Each directorate shall make sure that:

a. All directorate activities, facilities, and employees related to hazardous materials are completely addressed.

b. All employees have access to hazardous materials inventory, MSDSs, and a copy of this chapter during their shift.

c. Employees keep their area hazardous materials inventory up to date in the on-line master site inventory.

Exempted materials

14. Products that are exempt from this chapter

You shall be familiar with the products and materials listed in the table below.

For . . .	***Regulated by . . .***	***Covering . . .***
Pesticides	29 CFR 1910.1200 EPA Clinical Services Branch	All aspects of pesticides with the exception of labeling requirements. Labeling requirements. Facilities handling pesticides including insecticides, fungicides, rodenticides, and herbicides. **Note**: Only facilities designated by the Environmental Office as qualified to use pesticides should have pesticides stored on their premises. This ban includes even small amounts of pesticides, such as wasp and ant killer. The only exception is personal-use items such as "Off".
Hazardous Wastes	29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response," through the Environmental Office	Using hazardous chemicals or mixtures to treat hazardous waste is within the extent of hazard communication. • While hazardous waste is exempt from JSC's hazard communication program, hazardous waste workers shall have access to all the services and benefits of JSC's hazard communication program. • Once you identify a material as a hazardous waste, the material is no longer under JSC's hazard communication program (see JPR 8500.1, "Environmental Compliance Procedural Requirements").

Consumer Products	Consumers Product Safety Act and the Federal Hazardous Substances Act	Substances that must be packaged and labeled for the consumer market and their use in the workplace. • They shall be used in a manner similar to that of consumer use in the scope of this exemption. • You shall show that your use is similar to consumer use, which is usually obvious. • This exemption does not include paints or WD40. If you have any doubt, contact the Clinical Services Branch or Occupational Health Department for help.
Foods, Drugs, Cosmetics	FDA	Foods, food additives, fragrances, flavors, color additives, drugs, cosmetics, and medical or veterinary devices in all respects. They are exempt from this program when they are meant for human consumption. This includes drugs that are in solid, final form for a patient to take such as pills or tablets or are in retail establishments and packaged for sale to consumers.
Beverage Alcohol	Federal Alcohol Administration Act	Distilled spirits including beverage alcohol, wine, or malt beverage intended for nonindustrial use in all respects.
Tobacco Products	Federal Alcohol Administration Act	Tobacco products in all respects.
Medical Supplies	Space Medicine Division	Drugs, narcotics, and controlled substances.
Radioactive or nuclear materials	Space Life Sciences Directorate	All radioactive or nuclear materials and their use (see JPD 1860.4, "Radiological Protection Policy")
Pyrotechnic (explosive) materials and devices	Energy Systems Test Branch and the Aircraft Operations Division (Ellington Field)	Pyrotechnic materials and devices located at JSC and Ellington Field (see JPD 4500.1, "Pyrotechnics – Logistics Management")

15. Exemption of wood and wood products

Wood and wood products are exempt in full from this chapter.

16. Articles other than raw chemicals

You shall follow these steps to determine whether an article will be considered as a hazardous material:

a. First determine whether the item meets the definition of an "article" under 29 CFR 1910.1200. If any item meets all of these criteria, it is an "article" and exempt from the requirements of the Hazard Communication Standard:

   1. It has a specific shape or design as a result of its manufacture.
   2. It has end-use function(s) that depend in whole, or in part, upon its shape or design during end use.
   3. It doesn't release, or otherwise result in, exposure to a hazardous chemical under normal conditions of use.

b. Assess the hazard potential for articles that fail to meet one or more of the criteria listed above.

c. Consider the entire lifetime of the article, including initial fabrication, test, end use, maintenance, storage, demolition, and disposal. Review the results of these assessments at the appropriate review activities such as design reviews or TRRs. You shall have Safety and Occupational Health concurrence on the results of these assessments.

Note: Examples of articles that clearly fall under JSC's hazard communication program are welding rods, metal stock, and many construction materials (other than untreated wood).

Labeling and other forms of warning

17. Labeling storage and transportation containers

Follow these requirements for labeling storage and transportation containers:

a. You need to label all storage containers, tanks, vessels, drums, etc., meant for holding any quantity of hazardous materials for any period of time. The label shall include the following:

   1. The identity of the hazardous material, identical to the trade name on the MSDS
   2. Hazard warnings

   The Clinical Services Branch will provide guidance in the design and use of hazardous materials labels or other means to warn users of physical and health hazards.

b. When you use containers for transporting hazardous materials to or from JSC, you need to identify the containers. The DOT requires placards on containers (for example, truck, train car, etc.) of hazardous goods meeting certain type and weight requirements that are transported within the U.S. or on U.S. waterways. The identification shall include the following:

   1. The name of the authorizing official, the assigned office, or element
   2. The address of the organization authorizing the shipment

c. You shall only use shipping containers with DOT approval specific for the material to be shipped.

d. While you are onsite you may not transport hazardous materials in your personal vehicle.

e. You may not bring personal hazardous materials (i.e., gasoline, etc.) onsite.

18. Transfer containers

You don't need to label the containers that you use to quickly transfer a material between containers. This exemption includes beakers, buckets, funnels, portable pumps, and similar equipment. If you do not use all of the material immediately, you must label the container with the identity of the material and hazard warnings.

19. Identifying pipeline, ducts, valves, etc.

You shall clearly identify:

a. All pipes, ducts, valves, etc., that carry hazardous materials in any form or visibly connect to hazardous materials sources per Chapter 9.1, "Hazardous material safety and health," of this handbook.

b. Pipes, ducts, etc., that connect to hazardous materials sources and don't carry the materials in a manner that is clearly visible to any observer.

c. The contents of pipes, ducts, etc., if you can't see their contents because of obstructions such as a wall or if they are underground.

d. If the number or location of pipes, ducts, etc., in any area makes it difficult to identify each one, you may hang placards around the area or along its length. Placards may take the form of color coding, labels, or signs. You shall place placards according to their size, visibility, and the points of approach to the area.

Material safety data sheets

20. Availability of MSDSs

The following requirements apply:

a. You shall be able to readily access MSDSs in your work area during your work shifts.

b. Your supervisor shall maintain an up-to-date hardcopy file of MSDSs for hazardous materials that you use in your operations in a readily accessible location.

c. All MSDSs in your work area shall have a JSC MSDS number. Replace any unnumbered MSDSs with numbered copies from Occupational Health Department. MSDS are also accessible on line through the Health Home page at http://sd.jsc.nasa.gov/omoh/scripts/OccupationalHealth/MSDS.aspx. See Chapter 9.1 of this handbook for ordering MSDS for hazardous materials used in your work area.

d. If the MSDS in your work area is newer than the one in the MSDS database, send a copy of the MSDS along with a JF277 to the Hazard Communication Department of Occupational Health at SD3229.

e. If the MSDS in the MSDS database is older than 3 years old, check with the manufacturer to determine if there is a more current MSDS.

Employee training and information

21. Training for handling hazardous materials

Training and certification are the responsibility of line management and shall meet the following:

a. Everyone who works at JSC shall take initial and annual basic Hazard Communication (HazCom) training.

b. Individuals who work with hazardous materials or those who work in buildings that contain hazardous materials shall initially take instructor-led HazCom training. After taking an instructor-led class, you may take your annual training through the on-line HazCom training accessible on SATERN. Individual contractors may arrange to provide their own HazCom training as long as the training meets the requirements of 29 CFR 1910.1200 and this handbook and has been approved by the Clinical Services Branch.

c. If you work in an office environment in a building that does not contain hazardous materials, you may take both your initial and annual training through SATERN.

d. If you handle or use hazardous materials, or work in an area with hazardous materials, you also need to get specific information and training on the hazardous materials in your work area. This shall be completed by your supervisor when you are first assigned, annually, and when new hazards or chemicals are introduced in your work area. Organizations may request substance specific training from the Occupational Health Department, x36726.

e. Basic and specific HazCom training shall collectively explain:

   1. The requirements of 29 CFR 1910.1200.
   2. Operations in your work area where hazardous materials are present.
   3. The location and availability of the written HazCom program, lists of hazardous materials, and MSDSs.
   4. Methods and observations to detect the presence or release of a hazardous material in the work area such as visual appearance or odor.
   5. Physical and health hazards of the materials in the work area.
   6. Measures you can take to protect yourself from these hazards. This includes specific procedures that protect you from exposure to hazardous materials such as work practices, emergency procedures, and personal protective equipment.

7. Details of JSC's HazCom program, including an explanation of the labeling system, the MSDSs, and how you can obtain and use the appropriate hazard information.

Note: HazCom training records are available through SATERN. Records on training completed before March 2007 are available from the Occupational Health Department (SD33).

22. Information on hazard communication

Your manager shall make the following information available to you on request:

a. 29 CFR 1910.1200, "Hazard Communication Standard"

b. A written copy of this chapter, "Hazard communication"

c. MSDSs for hazardous materials in your work area

d. The hazardous materials inventory for your work area as described in paragraphs 9 through 13 of this chapter

Responsibilities

23. Employees, on-site contractors, and employee representatives can support this program

You can support JSC's HazCom program by:

a. Following the guidelines in chapters 9.1 and 9.2 of this handbook.

b. Reporting all safety and health issues to your supervisor for resolution.

c. Participating in the JSC Safety Action Team (see Chapter 1.1, "Management commitment," of this handbook). Participation allows you to comment on policy, accompanying surveys, and inspections, developing necessary corrective actions, and verifying the completion of all corrective actions.

24. Responsibilities for hazard communication

The following individuals and organizations have responsibilities for hazard communication:

a. As a ***line manager*** at any level, you are responsible for identifying and acquiring all necessary resources to implement the HazCom program and oversee the program in your organization.

b. As a ***supervisor***, you are responsible for addressing any employee concerns or complaints and making sure your employees:

1. Complete the training required by 29 CFR 1910.1200 and JSC's hazard communication program.

2. Know the necessary safety information, including hazardous materials inventories and MSDSs.
3. Have reviewed applicable job hazard analyses, job safety analyses, and other safety and health hazard assessments and evaluations annually.
4. Select, use, and care for protective clothing, equipment, and emergency facilities.
5. Select and use monitoring equipment properly.
6. Have access to a copy of this chapter and the MSDSs.
7. Tell Center Operations of any hazards that need to be corrected (existing or potential) to make sure handling or use of hazardous materials in JSC facilities is safe.

c. The ***Center Operations Directorate*** is responsible for making sure facilities are designed and built to anticipate hazardous conditions from activities that use hazardous materials as requested by line management, the Safety and Test Operations Division, or the Clinical Services Branch.

d. The ***Clinical Services Branch*** is responsible for:

1. Reviewing guidelines, evaluations, and recommendations for health protection measures to make sure that they meet health standards for control of, or exposure to, hazardous materials.
2. Helping line organizations implement all the health aspects of the Hazard Communication Standard and JSC's hazard communication program.
3. Maintaining a central repository of MSDSs and the hazardous materials inventory.
4. Making HazCom training available to JSC employees, both contractor and civil service.

e. The Safety and Test Operations Division is responsible for:

1. Reviewing guidelines, evaluations, and recommendations for safety protection measures to make sure that they meet safety standards for control of, or exposure to, hazardous materials.
2. Helping line organizations implement all the safety aspects of the HazCom standard and JSC's hazard communication program.

Special requirements

25. Laboratory requirements

The following requirements apply to laboratories:

a. All JSC laboratories, meeting the definition in 29 CFR 1910.1450, shall follow the requirements in this chapter and Chapter 6.8, "Laboratory safety and health," of this handbook.

b. If you work in a laboratory, you are responsible for demonstrating an understanding of, and the ability to practice, good laboratory techniques, including procedures to decontaminate yourself and the facility in the event of a spill or escape.

c. Facilities engaged in manufacturing-type operations or in large-scale, multi-personnel activities that require close coordination of efforts are responsible for following the general requirements of the program found elsewhere in this handbook.

26. Security-sensitive materials

If you control any security-sensitive hazardous materials, contact the JSC Security Office for guidance. Also coordinate with the Clinical Services Branch and the Safety and Test Operations Division. You shall:

a. Generate a memorandum of understanding (MOU) outlining how you follow the intent of JSC's HazCom program. The Clinical Services Branch and the Safety and Test Operations Division shall review and concur on the MOU.

b. Consult the Clinical Services Branch and the Safety and Test Operations Division to help you determine whether specific materials are security sensitive.

c. Never include drugs or narcotics, controlled substances, nuclear or radioactive substances, or explosives on unclassified lists of hazardous material.

d. Compile classified lists separately and lock them in files.

e. Restrict the distribution of copies of such lists to the following:

   1. Clinical Services Branch
   2. Safety and Test Operations Division
   3. Security Office
   4. Responsible division office

f. Allow access to such lists by any other person only if authorized by the Occupational Health Officer, with the concurrence of the requester's division chief.

Contractors

27. Contractors who use hazardous materials on site

If you, as a contractor, work with hazardous materials on site at JSC, you shall:

a. Obtain the following information before you begin any work on site:

   1. A copy of this chapter.
   2. Instructions on accessing JSC's site-wide hazardous materials inventory.

3. Instructions on accessing the NASA/JSC MSDS database for hazardous materials at JSC, Sonny Carter Training Facility, and Ellington Field.

b. Distribute this information to employees according to 29 CFR 1910.1200.

c. Make sure your employees see the information in subparagraph a. above.

d. Follow the requirements of JSC's HazCom program by working with your NASA technical manager.

e. Have access to any information and technical help you need from JSC safety and health personnel. If you do specific, short-term jobs on site, you will be given information for pre-start reviews of your safety and health programs and scheduled activities. JSC will support you on a case-by-case basis.

f. Perform the same duties that distributors perform for manufacturers and customers if they distribute hazardous materials at JSC.

g. State your contract safety and health plan and how you will review purchase requests, if you will purchase hazardous materials to be brought on site.

h. Describe how you will implement HazCom in your safety and health plan. The Safety and Test Operations Division will formally request updates through procurement channels.

i. Supply a list of all hazardous materials used at JSC to the Occupational Health Department for review when your contract starts, and update and submit the lists at least yearly. You shall provide information in a way to support the Clinical Services Branch's computer database.

j. Inform the Occupational Health Department of any hazardous material you need to purchase and use in an on-site facility for the first time. You shall supply a copy of the current MSDSs for all hazardous materials you bring on site at JSC.

28. Using hazardous materials off site

If you, as a contractor, use hazardous materials off site, you shall follow all applicable statute, code, or regulation as required.

References

29. For more information on hazard communications

You can find more information at:

a. *Department of Transportation Emergency Response Guidebook* (latest edition)

b. NPR 8715.3, "NASA General Safety Program Requirements"

c. 29 CFR 1910.1200, "Hazard Communication Standard"

d. 29 CFR 1910.1450, "Occupational Exposure to Hazardous Chemicals in Laboratories"

e. *The Occupational Environment: Its Evaluation, Control, and Management*; Second Edition, American Industrial Hygiene Association, 2003

f. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices (TLVs® and BEIs®),* American Conference of Governmental Industrial Hygienist, latest edition

Chapter 9.3
Pesticide control

This could be you . . .

An employee who worked in an area that had been treated with pesticides contacted the pesticides. This caused his skin to itch, blister, crack, and change color.

After spraying pesticides, a worker did not wash thoroughly before eating and suffered mouth, throat, and stomach burns as a result.

A worker dropped a pesticide container that ruptured and splashed pesticide into the worker's eyes.

1. Applicability of this chapter

You are required to follow this chapter if you:

a. Store, handle, mix, apply, or dispose of pesticides as part of your job.

b. Work in an area that has been treated with pesticides.

2. What this chapter covers

This chapter covers the minimum requirements for storing, handling, mixing, applying, and disposing of pesticides. You'll find emergency information in paragraphs 12 and 13.

3. Definition of a pesticide

A pesticide is any substance that prevents, destroys, repels, or mitigates any pests such as insects or weeds. They are called insecticides, herbicides, or additives.

4. Required information for any pesticide you are working with

You shall have either information from the original container label or MSDS with you while working with any pesticide. They tell you:

a. Contents by generic and trade names.

b. Directions for use:

   1. Plant material, animal, or site to which the product is to be applied
   2. Specific pest to be controlled by the product
   3. The situation, location, and conditions under which you may use the product
   4. Rate and equipment requirements

5. How to apply the product
6. When to apply the product

c. Statement of classification.

d. Hazards to humans, animals, or the environment.

e. Statement of practical treatment.

f. Signal word and precautionary statements:

1. Danger – highly toxic product
2. Warning – moderately toxic product
3. Caution – low-order toxicity product

5. Precautions to observe when storing and handling pesticides

If you store or handle any pesticides, you shall observe these precautions:

a. Store pesticides in original containers with legible labels. The label will tell you how to store the product, when practical.

b. Make sure the storage area is secured at all times.

c. Make sure the storage area is well ventilated with an exhaust fan. Turn the exhaust fan on at least 10 minutes before entering and keep it on at all times when personnel are inside the storage area

d. When removing pesticides from a chemical storage facility or storage area, note the exact amount used on a chemical checkout sheet.

e. If you are a spray operator, you are responsible for safely transporting pesticides.

f. Make sure all pesticides containers are secured so they don't break and spill.

g. Don't leave pesticides unattended or unlocked.

h. Keep all paper and cardboard containers dry.

i. Fill out and approve the chemical use sheet before using pesticides.

6. Precautions to observe when mixing pesticides

If you mix any pesticides, you shall observe these precautions:

a. Don't mix pesticides inside chemical storage areas. Always mix pesticides outside in open air.

b. Always have another person present when mixing pesticides.

c. Read directions before opening a container or mixing pesticides.

d. Don't put a water nozzle directly into a pesticide solution. Keep a minimum of 18 inches between water nozzle and solution to prevent back siphoning.

e. Minimize splashing.

f. Make a slurry of pesticide powders and water before adding it to a spray tank.

g. Be aware of fire hazards.

h. Wear required safety equipment.

7. Precautions to observe when applying pesticides

If you apply any pesticides, you shall observe these precautions:

a. Notify the facility manager 24 hours in advance of any pesticide application.

b. Apply pesticides in strict accordance with the label or manufacturer's directions.

c. Special applications such as pesticide "fogging" around potentially occupied areas require you to post a warning at least 24 hours in advance.

d. Keep pesticides away from people. Don't spray if others are close.

e. Shower at the end of the day with soap.

f. Have a physical every 6 months to determine physical health and chemical toxin levels in the body.

g. Don't smoke, eat, or drink during pesticide application. Clean your hands before you do smoke, eat, or drink.

h. Have MSDSs for the pesticides you are using readily accessible.

8. Disposing of pesticides

When you dispose of any pesticides, you shall:

a. Rinse empty containers at least three times and pour the rinse water into a spray tank.

b. Punch several holes in empty containers and place them in a dumpster.

c. Put liquid chemical waste in metal containers and notify the Operations Control Center at (281) 483-2038 for pickup.

9. Precautions to observe when using pesticide equipment

When working with pesticide equipment, you shall observe these precautions:

a. Make sure equipment is in good working condition before adding pesticides.

b. If you have a mechanical problem, thoroughly clean equipment before taking it to the mechanic.

c. Clean equipment as soon as you finish using it (inside and out).

d. Properly dispose of cleaning waste.

10. Protective clothing and equipment to use when working with pesticides

If you work with any pesticides, you shall wear the following personal protective equipment:

a. Disposable sprayer suit: Never wear a sprayer's suit longer than 4 hours.

b. Goggles: Wear snugly but comfortably.

c. Rubber boots: Wear them under your pant leg so pesticides won't run into the boots.

d. Rubber gloves: Wear them outside your sleeve if spraying upwards and inside your sleeve if spraying toward ground.

e. Respirators (as required): You shall be assigned your own respirator and never share it. Replace the filter after 8 hours of actual use. Replace the filter each day or more often if breathing becomes difficult for you or if you smell pesticide odors.

Note: See Chapter 5.6, "Personal protective equipment," for information on getting, using, and cleaning your PPE.

11. Training to work with pesticides

If you work with any pesticides, your training shall include the following:

a. Certification under federal and state laws and regulations. See Chapter 5.8, "Hazardous operations: safe practices and certification," of this handbook for more information on certification.

b. First-aid training for at least one person on each shift. The training shall include the symptoms of overexposure to pesticides.

c. Proper use and maintenance of respirators. This includes a complete medical exam and respirator fit test as described in Chapter 7.2, "Respiratory protection," of this handbook.

12. Emergency actions for pesticide spills

If a spill occurs in the field, you shall follow these steps in this order:

a. Give first aid if necessary. First-aid kits and eyewash bottles shall be within easy reach on all vehicles.

b. Stop the flow from the sprayer. You shall understand the flow of pesticides through the spray equipment and how to stop the flow with the least damage.

c. Contain the spill if pesticide could flow into storm sewers. This may not be a problem if you are using a dry material or if a leak occurs over grass. Dike the spill with sod or soil. Absorb the pesticide with soil, sawdust, or a special product for absorbing pesticides.

d. Notify the Project Manager or Technical Foreman to get help if necessary and have someone follow up on the spill. If immediate response is necessary, call your emergency number.

e. Rope off the area to warn people of the spill and prevent further contamination.

f. Don't leave the spill unless there is someone there to warn people of the hazard.

g. Clean up the site. This is the most critical step. To clean up you shall:

   1. Dispose of absorbents properly and remove and dispose of contaminated soil.
   2. Shovel all contaminated material into a leak-proof container and dispose of the material as excess pesticides.
   3. Observe plants that have been accidentally doused to assess the damage.

h. Find the reason for the spill and take any necessary steps to prevent another spill.

13. Actions for an overexposure to pesticides

Remember, your emergency numbers are: x33333 at JSC, Sonny Carter Training Facility, and Ellington Field, 911 at any off-site location, and x5911 at WSTF.

If you think you or a coworker has been overexposed to pesticides, you shall:

a. Notify your supervisor immediately or call your emergency number.

b. Get prompt medical attention.

c. Take the actions shown in this table for specific overexposures:

If . . .	***Then you shall . . .***
Pesticides are spilled on you	• Wash the exposed skin with soap and water for at least 15 minutes • Change any contaminated clothing promptly • Shower well before putting on clean clothes
You feel dizzy or sick on the job	• Report it immediately to your supervisor • See a doctor if there is any chance illness is due to pesticides
You ever have an itching or a burning sensation on the skin while working with pesticides	• Immediately wash the affected area thoroughly with soap and water
You detect unpleasant odors or unusual odors	• Leave the area immediately and report it to your supervisor
Pesticides get into your eyes	• Rinse them thoroughly with clean water for at least 15 minutes and then have them checked by a doctor

d. Give the medical staff full details on the pesticide.

14. For more information on pesticide safety, laws, and regulations

You can find more information on pesticide control in these documents:

a. MSDSs for specific pesticides

b. The Federal Insecticide, Fungicide, and Rodenticide Act

c. Structural Pest Control Board Law and Regulations; The State of Texas, January 1993

d. Texas Pesticide Regulations; Texas Department of Agriculture, March 1990

e. Texas Pesticide Laws; Texas Department of Agriculture, 1989

f. *Texas Pesticide Applicator Trainer – General Manual: Commercial and Noncommercial*; Texas Agricultural Extension Service

g. *Applying Pesticides Correctly – A Guide for Private and Commercial Applicators*, U.S. EPA, 1991

h. *Working Safely with Pesticide*,; U.S. Department of Health, Education, and Welfare, Public Health Service, CDC, NIOSH, March 1976

i. New Mexico Pesticide Laws, for WSTF

Chapter 10.1
Safety and Health Requirements for Designing, Constructing, and Operating Facilities

1. Applicability of this chapter

You are required to follow this chapter if you:

a. Design, construct, alter, repair, or operate facilities at JSC or JSC field sites. This includes design and construction to modify existing facilities.

b. Oversee facility operations as a line manager or facility manager.

c. Paragraph 14 lists the responsibilities of directors, the Facility Management and Operations Division, the Safety and Test Operations Division, the Clinical Services Branch, and the Environmental Office.

Requirements for designing and operating facilities

2. General requirements to follow when designing and constructing facilities

To design a safe facility, you shall make sure safety, health, and environmental hazards in the facility are controlled. In addition to the standards and requirements in paragraphs 4 and 5 of this chapter, the following requirements apply to new facilities and modifications to existing facilities:

a. Make sure representatives from both the Safety and Test Operations Division and the Occupational Health Department attend all pre-design and project reviews. Make sure the facility manager is involved with and approves any facility modifications.

b. You shall never modify an existing facility unless you coordinate with the Center Operations Directorate.

c. Reference all codes and standards for the facility design in the drawings and specifications so that the general construction contractor and subcontractors will know which requirements to follow.

d. Control hazards in the facility design by one or more of the following:

   1. Making sure that all standards, codes, and requirements that apply to the facility are incorporated into the design, specifications, and drawings. This method is best for standard facility systems such as electrical, fire, and plumbing and for standard work areas such as office areas.

   2. Planning the location, design, and layout of the facility carefully and considering what operations will occur in the facility and what maintenance will be required. This

includes a Facility Safety Management Plan as described in paragraph 8.6 of NPR 8715.3, "NASA General Safety Program Requirements."

3. Doing preliminary hazard analyses and follow-on hazard analyses on the facility or parts of the facility as described in Chapter 2.4, "Hazard Analysis," of this handbook. Hazard analyses should begin when you develop the early design concepts and continue as you develop more design details. You shall do hazard analyses on all building areas.
4. Following the requirements in JPD 8820.3, "Facility Configuration Management Program."

e. Do an environmental review before or during the design phase as described in JPR 8550.1, "JSC Environmental Compliance Procedural Requirements."

f. Design and install ventilation systems to meet ASHRAE STD 62-2001, "ASHRAE Standard: Ventilation for Acceptable Indoor Air Quality," and ASHRAE STD 55-2004, "Thermal Environmental Conditions for Human Occupancy," and National Fire Protection Association standards. These standards require you to:

1. Make sure the design supplies ventilation air throughout the occupied space.
2. Maintain acceptable indoor air quality throughout the occupied space even when the air supply is reduced when the area is occupied, such as in variable air-volume systems.
3. Use either the ventilation rate procedure or the indoor air quality procedure in designing the system, and document your assumptions. You can find the procedures in the ASHRAE standards cited above.
4. Control temperature and humidity to limit microbial growth.
5. Supply outside air for ventilation in volumes that meet ASHRAE STD 62-2001 requirements.
6. Make sure the outside air used for ventilation meets National Primary Ambient-Air Quality standards.
7. Install duct detection and shutdown relays where required by the National Fire Protection Association.

g. Avoid designing obstructions or projections into an aisle or passageway if possible. If they are necessary, call for them to be marked or flagged. Pointed, sharp, or jagged obstructions or projections shall be covered and maintained with resilient material. Follow National Fire Protection Association Standard 101, 29 CFR 1910, and 29 CFR 1926.

h. Follow these requirements for emergency showers and eyewashes:

1. Meet or exceed ANSI Z358.1 (current version).

2. Install emergency showers and eyewashes in laboratories and other areas where hazardous chemicals, acids, or other corrosive substances are handled, used, stored, and transported.
3. Locate emergency showers and eyewashes in accessible locations that require no more than 10 seconds to reach. Keep the path of travel free of obstructions that may inhibit the immediate use of the emergency equipment. You may provide personal eyewash bottle only to supply immediate flushing until a plumbed or self-contained eyewash can be reached. Personal eyewash bottles support plumbed and self-contained units but never replace them. You shall inspect and maintain personal eyewash bottles per the manufacturer's requirements.
4. Provide adequate drainage and nonslip floor surface.

i. Make sure the design of clean rooms and laminar-flow clean work stations that contain cleaning facilities using flammable or toxic fluids are evaluated and approved by the Clinical Services Branch and the Safety and Test Operations Division.

j. Follow the "Buy Quiet and Quiet by Design" requirements in Chapter 7.1 of this handbook.

3. Requirements to follow when operating facilities and equipment

When operating any facility at JSC or JSC field sites, you shall:

a. Follow all safety, health, and environmental requirements that apply to the operation. See other chapters of this handbook.

b. Develop facility operating instructions based on facility mission and operational requirements.

c. Develop procedures for hazardous operations in the facility that:

1. Contain enough detail to identify residual hazards and cautions.
2. Are conspicuously marked on the title page with a statement that the document contains hazardous procedures and strict adherence is necessary for safety and health.

d. Follow the configuration management requirements that apply to facility operations from JPD 8820.3.

e. Follow these requirements for emergency showers and eyewashes:

1. Meet ANSI Z358.1 (current version).
2. Flow test plumbed emergency showers and eyewashes weekly in routinely occupied areas to prevent water contamination and to make sure they work. Document the flow tests. The occupants of the lab or area of the eyewash or shower are responsible for the weekly flow tests.
3. If the unit fails to work properly, tag the unit out until repairs can be made and provide an equivalent unit.

4. For areas not normally occupied, such as mechanical rooms and Center Operations Directorate (COD) support services area, the workers entering the area shall do a flow test before starting work if the shower or eyewash has not been tested within the last 6 days.
5. If the unit fails the test, the work shall not proceed until the unit is repaired and in good working order or a temporary unit is provided.
6. If you use self-contained emergency showers or eyewashes, they shall have a water supply for at least 15 minutes of flow without refilling
7. You shall inspect and maintain emergency showers or eyewashes per the manufacturer's requirements.
8. Personal eyewash bottles don't meet the requirements for plumbed or self-contained eyewashes, but can be used initially. You shall inspect and maintain the personal eyewash bottles per the manufacturer's requirements.

f. Make sure elevators are inspected yearly by someone who is competent and independent of the organization doing the elevator maintenance. Immediately report any defects to the Safety and Test Operations Division and Work Control.

g. Follow these requirements for HVAC systems:

1. Make sure the HVAC runs only when the building is occupied and that the building is flushed by the ventilation system before people arrive unless other requirements forbid it.
2. Schedule maintenance activities that interfere with HVAC when the building is unoccupied or, if occupied, clear it with the Facility Manager at least 48 hours to a week before the shutdown. Inform the facility manager and occupants when you schedule these activities.
3. Maintain appropriate pressure relationships between building areas. For example, loading docks are a frequent source of exhaust odors. Keeping the rooms surrounding the loading docks under positive pressure prevents odors from being drawn into the building.
4. Make sure intake ducts are not next to sources of vapors, fumes, or mists, or to the exhaust ventilation ducts of that building or other buildings.
5. Never use chemicals around air intakes as the odor will enter the facility.
6. Avoid re-circulating air from areas that are sources of contaminants such as maintenance areas, chemical storage areas, and laboratories.
7. Compare makeup air quantities and ventilation rates to building design, building use, and ASHRAE STD 62-2001. Make adjustments as necessary. Keep in mind that increasing ventilation rates to meet ASHRAE standards may exceed the capability of HVAC equipment to condition the air in Houston's hot and humid climate.

8. Inspect all equipment regularly (per maintenance schedule) to make sure it is in good working order. Maintain dated records of maintenance inspections and repairs.
9. Maintain all equipment guarding per OSHA and ANSI standards.
10. Use checklists when conducting HVAC maintenance inspections to make sure all components are inspected. Document any changes in function, capacity, or operating schedule.
11. Take steps to prevent microbiological growth such as bacteria, mold, or mildew in HVAC components that are exposed to water such as drain pans, coils, cooling towers, and humidifiers. If you have any questions about these issues, call the Clinical Services Branch and the site work control (281-483-2038).

h. Follow these requirements for cooling towers:

1. Clean the cooling towers regularly. As a general rule, you shall clean cooling towers at least once every 3 months. You may clean them less frequently if performance data show that it is acceptable, but at least every 6 months. Performance data may require more frequent cleaning.
2. When a cooling tower has been shut down for a long time, do routine cleaning and disinfecting just before starting the equipment. Wear appropriate PPE when doing the work and maintain safety requirements if the area is a confined space or if fall protection is required.
3. Use chemicals sparingly. Add chemicals to the water at a rate sufficient only to maintain predetermined chemical concentrations. Keep the total bacteria count below the acceptable level.
4. Use an appropriate bleed-off. Bleed off water at a rate based on total dissolved solids, chlorides, or other appropriate parameter of the circulating water. Check the bleed-off rate during regular maintenance inspections.

4. Standards for facility design and operations

The following standards apply to facility design and operation. Use the latest edition unless otherwise noted below. If there are conflicts among any of the standards, follow the most stringent of the requirements.

For . . .	***Follow these standards . . .***
General facility design or operations	29 CFR 1910, "Occupational Safety and Health Standards, General Industry," specifically: 29 CFR 1926, "Occupational Safety and Health Standards, Construction Industry" International Building Codes NPR 8715.3, "NASA General Safety Program Requirements," Chapter 8

For . . .	*Follow these standards . . .*
	NPR 8820.2, "Facility Project Implementation Guide"
	NASA-STD-8719.7, "Facility System Safety Guidebook"
	JPD 8820.3, "Facility Configuration Management Program"
	JPR 8553.1, "JSC Environmental Management System Manual"
	JPR 8500.1, "JSC Environmental Compliance Procedural Requirements"
	Other Chapters in this handbook or standards in 29 CFR 1910 that apply to the facility
Fire Safety	Public Law 91-596 (OSHA Act), 29 CFR 1910 and 29 CFR 1926
	Public Law 100-678 (Section 6), "Compliance with Nationally Recognized Standards"
	NASA-STD-8719.11, "Safety Standard for Fire Protection;" this document doesn't detract from National Fire Protection Association codes and standards
	National Fire Protection Association standards, latest edition; you are encouraged, but not required, to use National Fire Protection Association "recommended practices" in the National Fire Codes
	FM data sheets
	Uniform Fire Codes with Houston amendments
	UL Standards
Fault tolerance requirements for safety-critical systems	Other chapters in this handbook or standards in 29 CFR 1910 that apply to the facility NPR 8715.3, paragraph 1.7
Designing or operating certain facility systems	ANSI/ASME A17.1, "American National Standard Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks," as amended
	American Society of Heating and Refrigeration Engineers standards
	American Society of Mechanical Engineers Boiler and Pressure Vessel Safety Code
	JPR 1710.13, "Design, Inspection, and Certification of Pressure Vessels and Pressurized Systems"
	ANSI/Illuminating Engineering Society standard RP-7, "Standard Practice for Industrial Lighting" (Advisory)
	ANSI/Illuminating Engineering Society standard RP-1, "Standard Practice for Office Lighting" (Advisory)
	Other chapters in this handbook or standards in 29 CFR 1910 that apply to the facility system

5. Fire safety requirements for facility design

As a facility designer, you shall make sure JSC facilities meet all fire safety requirements that apply. The following requirements apply as well as the standards in paragraph 4 above:

a. Before designing any changes to any existing facilities, make sure a comprehensive fire protection engineering survey and preliminary hazard analysis is done to identify any fire safety problems in the facility. Correct these problems in your new design.

b. You may use less stringent requirements or other fire protection methods if a thorough fire protection engineering study shows that you will have at least an equal level of fire protection as provided by the above standards. The Safety and Test Operations Division shall approve the use of less stringent requirements.

c. You may use these documents as guidelines to help you resolve fire protection issues:

   1. FM Loss Prevention data sheets
   2. National Fire Protection Association, "Fire Protection Handbook"
   3. Society of Fire Protection Engineering, "Handbook of Fire Protection Engineering"
   4. National Fire Protection Association, "Industrial Fire Hazards Handbook"
   5. OSHA 29 CFR 1910 and 29 CFR 1926

Requirements for constructing facilities

6. Requirements for installing new local exhaust ventilation systems

Follow these requirements when installing new local exhaust ventilation systems such as exhaust hoods:

a. Consult the Clinical Services Branch and the Safety and Test Operations Division early in the planning and design or selection of a new exhaust hood and do a preliminary hazard analysis.

b. Consider the kinds of chemicals to be used, the quantity of the chemicals, and the conditions for the use of the chemicals.

c. Use a local exhaust ventilation system to protect workers from airborne contaminants such as fumes, vapors, or dust. Make sure the local exhaust ventilation system that you use is effective in removing contaminants from the work area and exhaust the contaminants outside the building.

d. Report the installation of any new local exhaust ventilation system or modification of an existing system to the Clinical Services Branch for evaluation before starting up the system and to the Safety and Test Operations Division before installations for approvals.

e. **Special Note for Perchloric Acid Hoods**: Heated perchloric acid produces vapors that condense and form explosive perchlorates. Construct designated perchloric acid fume hoods with materials that won't readily react with perchloric acid and make sure that the hood has wash-down capabilities. Designate perchloric acid hoods with a sign reading:

Perchloric Acid Only: Coordinate the design with the Safety and Test Operations Division.

7. Requirements for constructing facilities

If you do or oversee any construction at JSC, you shall follow 29 CFR 1926, "Occupational Safety and Health Standards, Construction Industry," and 29 CFR 1910, "Occupational Safety and Health Standards, General Industry." Use EM 385-1-1, "U.S. Army Corps of Engineers Safety and Health Requirements," as a guide. EM 385-1-1 is mandatory for U.S. Army Corps of Engineers projects. The following general requirements also apply:

a. You shall also follow JSC's construction safety, occupational health, and environmental requirements in the paragraphs below.

b. Pre-award meetings shall review JSC fire, occupational safety, occupational health, security, and operations requirements of the contract and include both the prime contractor and subcontractors. The Safety and Test Operations Division, Clinical Services Branch, and Environmental Office attend these meetings as required.

c. Construction supervisors shall control the construction site, workers, and visitor access, especially with regard to safety and health. See paragraph 11 of this chapter for more information.

d. Visitors shall have the permission of the construction supervisor in charge to enter the site.

e. You shall inform all organizations that may be involved with or affected by the construction or hazards that may result to include the Facility Manager, Safety and Test Operations Division, Clinical Services Branch, and Environmental Office.

f. Safety and Test Operations Division, Clinical Services Branch, and Environmental Office personnel shall be on the construction access list.

g. The organization doing the construction shall:

   1. Post all required OSHA notices, emergency telephone numbers, and a list of telephone numbers to call in case of an accident.

   2. Post all environmental notices and follow all environmental requirements, such as storm water controls and permits.

   3. Report all accidents and incidents immediately, including spills or discharge of toxic or hazardous material, by dialing JSC's emergency number (x33333) and to the person designated by the contracting officer, Safety and Test Operations Division, Clinical Services Branch, and the Environmental Office.

   4. Maintain the site exactly as it was before the accident or incident and keep on site all personnel involved or who have knowledge of the accident or incident at the scene.

   5. Complete and post all necessary permits and forms.

8. Safety oversight at construction sites

If you do any construction at JSC, you, as a prime contractor, shall observe the following requirements and enforce them with any subcontractors:

a. Appoint a contractor safety monitor who has the safety and health knowledge to be responsible for the overall safety of construction operations. This person is empowered to stop unsafe operations and enforce corrective action.

b. Have OSHA-competent safety supervisors and alternate supervisors to make sure workers know and follow all safety, health, and environmental requirements for the project. Supervisors shall always:

   1. Be dedicated to supervising and overseeing safety.

   2. Have a copy of the safety and health plan and any special written safety and health procedures on site and readily available.

   3. Be present or appoint a dedicated safety monitor to be present during hazardous operations or conditions, as required by the plan. Conduct a hazard analysis before conducting a hazardous operation and have it approved by the Safety and Test Operations Division and the Clinical Services Branch.

   4. Ensure that simultaneous tasks don't result in workers entering hazardous areas where entry is prohibited by hazard analysis, the Safety and Health Plan, or OSHA or NASA requirements. For example, entering an area with overhead work and the potential for falling objects.

c. Appoint someone to be responsible for safety and health during activation of the completed project.

9. Construction safety meetings

If you do any construction at JSC, you shall hold a pre-work safety meeting with your employees and regular safety meetings at least every 2 weeks. Document the subject and attendees. This includes briefing missing employees on the content of the meeting. You shall:

a. Coordinate these meetings with the COD Facility Management and Operations Division.

b. Cover at least the following in the meetings:

   1. Individual responsibility for occupational safety, occupational health, and environmental safety to include wearing PPE, mishap reporting, emergency information and who to contact, chemical waste storage, and dumping waste products.

   2. Specific hazards of the jobs being done and applicable OSHA and other safety standards associated with the phase of work in progress.

   3. Guards, barricades, and other devices designed to protect workers, the on-site contractor, government employees, and the public.

4. Other areas deemed important by you, JSC construction managers, or the Safety and Test Operations Division, Clinical Services Branch, and the Environmental Office.

10. Hazardous operations during construction

If your construction work involves any hazardous activities, you shall:

a. Follow the requirements in Chapter 5.8, "Hazardous Operations: Safe Practices and Certification," of this handbook. This includes getting the necessary permits and making sure workers are certified, as required for work at JSC, Sonny Carter Training Facility, or Ellington Field. Signatures and approvals for permits shall follow Chapter 5.8 with these exceptions:

   1. The JSC COD Construction Office, construction manager, or contractor safety and health representative may sign the "Responsible Safety Representative" signature block.
   2. The JSC COD Construction Office or construction manager may sign the "Fire Warden" signature block for new construction when there are no fire wardens or facility manager.
   3. The COD Construction Office, the construction manager, and the occupational safety and occupational health groups shall approve any entry into a confined space.
   4. Permits shall have all required signatures. Follow Chapter 6.10, "Entering Confined Spaces," of this handbook.

b. Make sure only competent, trained workers do hazardous tasks under competent supervision.

c. Assign an OSHA-required competent person to all excavations and trenching operations.

d. Assign a qualified electrical worker to all electrical work.

e. Follow other parts of chapters of this handbook as required:

   1. Chapter 8.2, "Lockout/Tagout Practices"
   2. Chapter 5.6, "Personal Protective Equipment"
   3. Part 4, "Health protection practices"

11. Protecting the work area

To protect the construction employees; NASA-JSC Project Management Team members; other JSC civil servants; contractors, and subcontractors; consulting employees; and visitors in and around the work site, you shall follow these requirements:

a. Post signs at all construction or maintenance entrances notifying anyone who enters this project site as to who is allowed on this site; where to report when entering the site, if a

sign-in is required; what PPE is required and when it is to be used; and any other job site requirements (i.e., authorized construction and JSC inspection personnel only).

b. The project site shall follow all OSHA, EPA, National Fire Protection Association, and NASA-JSC Safety and Health Handbook Requirements.

c. Conspicuously post emergency contact numbers for key project personnel on the sign.

d. Fixed barriers shall meet the requirements in the OSHA standards for guardrails, 29 CFR 1910 and 29 CFR 1926, or be at a minimum substantial supported orange (nylon or plastic) barricade fencing with metal post 8 feet on center and meet the guardrail standard strength (minimum 200-pound direct pressure on top tail, as illustrated in the OSHA standard). You may also use sections of chain-link metal fencing as an alternative, provided they are supported by substantially anchored posts.

e. Establish adequate entrances to meet the current National Fire Protection Association and OSHA-required access, egress, and life safety codes.

f. All barriers shall be substantially supported and provide for adequate means of access or egress.

g. Barriers shall not create tripping hazards for personnel having to access or egress these hazardous or secured areas.

h. At excavations or trenches, the barriers shall be an adequate distance back on the outside perimeter of the spoil pile or an adequate set distance from the excavation opening, so that support posts and barrier do not fail if a person falls against the barrier. The minimum distance from the excavation opening is 2 feet, unless the ground is unstable or the side wall is undercutting or fissured.

i. Use barrier tape only for temporarily blocking interior facility room entrances or hallways where hazardous work is being performed. Barrier tape shall be a minimum of 4-feet back from the work area to provide workers with an adequate access area.

j. Entrances shall have at least two rows of tape set at the height requirements for handrails (42-inch top tape and 24-inch mid tape line).

k. Barrier tape and enclosures required by OSHA for specialized work (i.e., asbestos, dust barriers, hazardous waste locations, electrical, and others) shall meet applicable OSHA requirements.

l. Safety, occupational health, environmental, and security personnel may use temporary barriers to temporarily cordon off hazardous areas or areas required for investigation.

m. Railings and decking shall be free of all splinters, projecting nails, or other hazards that could produce injuries.

n. Rebar caps shall be the reinforced metal plate type and placed on all protruding rebar that presents a hazard to workers, regardless of height. Maintain the caps throughout the length of the hazard exposure.

o. All hazard warning devices mentioned before and others used on the project work site shall be colored or painted using brilliant contrasting colors and reflective panels (when required) meeting the most recent ANSI requirements.

p. Safety vests for flagging personnel shall meet current U.S. DOT's Manual on Uniform Traffic Control Devices (MUTCD) required ANSI/ISEA 107-1999 Standard for High Visibility Apparel – Class II requirements for daytime use and ANSI/ISEA Class III requirements for nighttime work.

q. Flags, warning signage, hand signaling devices, cones, barricades, and other devices shall meet the U.S. DOT/MUTCD requirements for daytime or nighttime operations.

r. Tag-faded or discolored fluorescent cones and signage not meeting these requirements shall be labeled as "Hazardous-Do Not Use" and repaired or removed from service.

12. Safety inspections and approvals at construction sites

If you oversee a construction site at JSC:

a. You shall inspect the site at least weekly for hazards and failures in following safety, health, or environmental requirements. Document any identified hazards. See Chapter 2.5, "Routine Inspections," of this handbook for more information.

b. Users shall inspect lifting equipment and scaffolds daily. See Chapter 8.5, "Lifting operations and equipment safety," and Chapter 8.7, "Ladders, Scaffolds, and Elevated Platforms: How To Work With Them Safely," for more information.

c. The Safety and Test Operations Division and COD shall inspect and approve all cranes at least 48 hours before a lift.

d. You shall submit lift plans and have them pre-approved by the Safety and Test Operations Division and COD. Submit noncritical lift plans at least 48 hours before the lift and before any lifting operations. Submit critical lift plans at least 72 hours before a lift and before any lifting operations. See Chapter 8.5, "Lifting Operations and Equipment Safety," for more information.

e. You shall use fall protection, if required, and:

   1. Inspect the equipment before and after each use.

   2. Maintain the equipment in proper working order and make sure any equipment used to stop a fall was not damaged in any way. See Chapter 5.6, "Personal Protective Equipment," for more information.

f. You may also be inspected by:

   1. The director or directorate safety committee that is or will be responsible for the facility at least monthly.

   2. The Safety and Test Operations Division, Clinical Services Branch, and Environmental Office (if applicable) periodically. These inspections may be announced or unannounced.

3. OSHA, EPA, and the TNRCC, unannounced visits. These agencies will issue citations and take necessary action for any violations. Compliance officers are present on site at varying times and may inspect your site. Immediately notify the center operations project manager's office and the Safety and Test operations Division if OSHA compliance personnel arrive at your site. Notify the Environmental Office if EPA or TNRCC personnel arrive at your site.

Other requirements and responsibilities

13. Approval for facility operations

Before you may operate a new or modified facility, it shall be approved by one of the following:

a. An operational readiness inspection if required by Chapter 10.3, "Operational readiness inspections for hazardous or critical facilities," of this handbook.

b. A readiness review, such as if deemed necessary by the director responsible for the facility. You would use this review for facilities or modifications that don't meet the criteria for an operational readiness inspection, but still involve risk to personnel or JSC operations. Use Chapter 10.3 of this handbook as a guide.

c. Acceptance inspections and tests of the facility and fire protection systems by the Facility Management and Operations Division and the Safety and Test Operations Division.

14. Responsibilities for designing or building facilities

The following people and organizations have responsibilities for designing or building facilities:

a. An ***organizational director*** at JSC is responsible for:

   1. Making sure facility designs meet the requirements in JPD 8820.3.

   2. Making sure any facility modifications done or contracted by your organization are coordinated with COD.

   3. Making sure an environmental review is done before or during the design phase as described in JPR 8550.1, "JSC Environmental Compliance Procedural Requirements."

   4. Submitting the drawings and specifications for facility modifications not overseen by the Facility Management and Operations Division to the Safety and Test Operations Division and the Clinical Services Branch for review and approval. This will avoid delays.

b. The ***Facility Management and Operations Division*** is responsible for:

1. Making sure facility designs meet the requirements in JPD 8820.3.
2. Making sure an environmental review is done before or during the design phase as described in JPR 8550.1, "JSC Environmental Compliance Procedural Requirements."
3. Sending drawings, specifications, and other design documents on any new construction or facility modification to the Safety and Test Operations Division and the Clinical Services Branch for review and approval.
4. Making sure that the responsible facility manager reviews and approves any facility modification project before advertising it for award of a contract.
5. Making sure that the Safety and Test Operations Division and the Clinical Services Branch approve the drawings, specifications, and other design documents before advertising a construction project for award of a contract.
6. Making sure necessary inspection and testing occur during critical phases of any construction project, whether it is new construction or a facility modification, and that the Safety and Test Operations Division and the Clinical Services Branch concur.
7. Making sure all required fire protection systems and features are installed, tested, and functioning properly as defined in contract specifications before final payment and that the Safety and Test Operations Division and the Clinical Services Branch concur.

c. The ***Safety and Test Operations Division*** and the ***Clinical Services Branch*** are responsible for reviewing and approving by signature the drawings and specifications of all construction projects. The Environmental Office shall review and approve by signature the drawings and specifications of all construction that involves an environmental issue.

Chapter 12.1
Introduction to Asbestos Control

1. Applicability of Asbestos Control Requirements

You are required to follow Part 12 if you conduct any asbestos-related activities at JSC, Sonny Carter Training Facility, or Ellington Field whether as a JSC organization, a resident support contractor, or a construction and fixed-price contractor. JSC field sites follow equivalent requirements that also meet their state and local regulations.

2. About Part 12

The general provisions of Part 12 include:

a. Part 12 specifies minimum acceptable standards and procedures for all JSC asbestos-related activities. It includes specific performance requirements for the most common asbestos-related tasks at JSC. The standards and procedures set forth are consistent with health and safety standards and procedures in industry and those established by OSHA, the EPA, and NASA. It also applies to other operations that may involve asbestos, even though they are not specifically cited in Part 12.

b. Part 12 provides policy, procedures, and guidance for conducting asbestos-related activities at JSC with minimum risk to the employees involved and to building occupants. Part 12 identifies controls for protecting workers, work practices, and methods of minimizing asbestos release. Workers and employees who follow these controls will also prevent the unnecessary exposure of building occupants to unacceptable concentrations of asbestos.

c. Generally, it is only necessary for a job supervisor or foreman to determine whether the work area is known to have ACMs and to select the appropriate procedures and controls necessary to perform the work. You can find an inventory of areas currently known to contain asbestos on the JSC Health Home Page at http://sd.jsc.nasa.gov/omoh/scripts/OccupationalHealth/AsbestosInfo.aspx.

d. Areas suspected to have ACM for which no data exist either shall be presumed to have ACM or have confirmatory bulk sampling and analysis completed before the work activity begins. Confirmatory sampling and analysis will be conducted by either the OHD or by the Facility Support Services (FSS) contractor. (See paragraphs 3.c, 3.d., and 3.e. below).

e. JSC recognizes that some of the requirements within Part 12 procedures may add expense and time delays to procedures previously in place. This is the cost of providing the additional degree of control afforded within the asbestos control procedures to ensure the occupational safety and health of workers at JSC.

f. Part 12 is organized to assist the job supervisor or foreman, hereinafter referred to as the originator, in accomplishing effective planning. Oversight and enforcement of the plan and the procedures established by Part 12 will be the responsibility of the APM (JE). The

APM will rely heavily upon the OHD in monitoring conformance with the asbestos control procedures established by the individual procedures. In rare cases, the APM, Clinical Services Branch, or OHD will issue a stop-work order under the authority of Chapter 1.0, subparagraph 3.d of this handbook, if work practices do not provide sufficient protection to workers and building occupants.

3. How to use Part 12 for planning and conducting asbestos-related activities

Planning and conducting asbestos-related activities follows the basic steps listed below:

a. The user establishes the job description and initiates the appropriate work order (e.g., work authorization document (WAD), modification, construction, rehabilitation, and repair (MCRR), Construction of Facilities Project). The user shall identify the asbestos hazard, if known, or request sampling assistance from the OHD to determine the hazard if the presence of asbestos is suspected but not known. The following apply:

   1. Any Construction of Facilities Project, WAD, or MCRR that will, or has the potential to, disturb facility or building materials shall have a written assessment from the OHD or FSS contractors on the presence or absence of ACM.
   2. The user shall involve the APM and the OHD in the planning, design, and construction of projects involving Class I and Class II asbestos work.
   3. Pre-approved project designs for Class I and Class II activities; involving less than 260 linear feet, 160 square feet, or 35 cubic feet of ACM or presumed ACM (PACM), and pre-approved project designs for a number of Class III and Class IV activities are described in Chapter 12.15 and Appendix 12B.
   4. All Class I, Class II, and Class III projects, not otherwise described in Chapter 12.15 or Appendix 12B, shall have a formal project design approved by an EPA-accredited project designer. The JSC APM or his or her designated representative shall approve the design.

b. The originator (usually the foreman or supervisor) determines whether the work area is identified in the JSC asbestos database as an area containing asbestos. Refer to the JSC Safety and Total Health Home Page http://sd.jsc.nasa.gov/omoh/scripts/OccupationalHealth/AsbestosInfo.aspx at for this listing.

c. If the work area is not identified in the database, the originator or supervisor shall check with the APM or the OHD (x36726) to determine whether there is any other evidence of asbestos in the area.

d. If no evidence can be found, the originator shall request the OHD perform bulk material sampling to determine the presence of asbestos. The OHD needs sufficient lead time, usually a minimum of 3 weeks, to coordinate sampling, obtain analyses, and write a report.

e. The FSS contractor shall collect bulk asbestos samples in support of its routine operations and maintenance activities and for WAD-generated minor construction. In lieu of

sampling, the originator may presume asbestos-containing materials (PACMs) are present.

f. If there is no ACM, PACM, or evidence of asbestos, the originator may proceed with the job as a normal non-asbestos job.

g. If any work area is identified in the database or other evidence indicates the presence of ACM, the originator shall plan an asbestos-related activity using Part 12. The originator shall also identify the scope of the work to be performed.

h. If asbestos is identified in the work area, but no pre-approved project design exists for the job to be performed, follow the alternative procedures of Chapter 12.2, paragraphs 5 and 6. The originator shall develop a project design for the job and have them approved by the APM and the OHD.

i. If a pre-approved project design exists for the job, the originator or supervisor reviews the requirements of the procedure and develops the asbestos work permit (shown in Appendix 12A). Refer to Chapter 12.4 for the classes of asbestos work and to Chapter 12.15 and to Appendix 12B for job performance requirements of work to be performed. Work permits are not required for Class IV asbestos work. The permit may be used as a coordination or notification document by sending a facsimile copy to the identified JSC office.

j. The originator or supervisor shall complete and sign the permit (see Appendix 12A), identifying the necessary controls.

k. The competent person for the job shall also sign the permit. Give this permit to the individuals assigned to the task and keep it at the asbestos work site, as well as a copy of the appropriate job performance requirements from the attachments in Appendix 12B.

l. Once the task is completed, return the work permit to the originator for recordkeeping. Maintain executed work permits for at least 1 year, and make them available to the APM upon request.

m. All asbestos-related work requires supervision by a competent person. The appropriate employer shall designate the competent person for each asbestos-related job. Qualifications of the competent person are subject to review by the JSC APM, the JSC Clinical Services Branch, or their designated representatives.

n. During the actual job, perform on-site inspections and monitoring as required by the procedure. If the assigned competent person is not at the job site, he or she shall visit the job site periodically during the course of the work.

o. Upon completion of the job, the originator conducts or requests clearance inspection and air monitoring, as required by the procedure. Additionally, the originator, supervisor, or Competent Person shall obtain a Work Control Pickup Ticket Number by calling Work Control at extension 3-2038 and enter this information on the work permit.

p. Upon satisfactory clearance inspection and air monitoring results, if required, the originator shall reestablish the work area and prepare and submit any documentation required by the procedure.

Chapter 12.2
Policy and Purpose

1. Policy

Chapter 1.0 of this handbook contains JSC's basic safety and health policy. Chapter 5.7 of this handbook discusses asbestos for the general JSC population. For asbestos control, it is JSC policy to:

a. Manage-in place all ACM at the center. JSC shall follow all applicable federal, state, and local regulations and guidelines to manage and control asbestos hazards on JSC property.

b. Create, maintain, and make available for employees to review all medical and exposure monitoring records as prescribed in OSHA regulations 29 CFR 1910.20, 1910.1001, and 1926.1101.

c. Never to expose unprotected and untrained personnel to more than 0.01 fiber per cubic centimeter (f/cc) of asbestos as an 8-hour TWA concentration. This level is based on the EPA "safe occupancy" level for reentry after an asbestos abatement project.

d. Never allow occupational exposures of workers performing asbestos-related activities to exceed the OSHA PEL of 0.1 f/cc (29 CFR 1910.1001, 29 CFR 1926.1101) unless protected by the appropriate level of respiratory protection and other PPE.

2. Purpose

Part 12 provides the information, guidance, standards, and procedures necessary to implement NASA and JSC policy relating to asbestos-related activities. The definitive procedures in Part 12 and the basic policies of federal regulations provide a basis for asbestos-related activities at JSC.

3. Program objectives

The following are the objectives of the JSC Asbestos Control Program (ACP):

a. The goal of the JSC ACP is to manage-in place the ACM in JSC buildings and facilities in a manner that minimizes asbestos exposure to building occupants, service workers, and the environment. To accomplish this, the ACP is designed to:

   1. Remove asbestos debris that may have been released from the ACM.
   2. Avoid or control disturbances of the ACM during building activities to eliminate or greatly reduce the release of fibers.
   3. Remove or repair damaged ACM.
   4. Implement a program of removal of asbestos materials as part of the JSC Facility Maintenance and Construction of Facilities Programs, as feasible.
   5. Isolate and respond to episodic, potential fiber release incidents.

6. Properly manage and dispose of asbestos waste.

b. The focus is on service workers and workers involved in operations removing ACM since their activities are most likely to release asbestos fibers. These activities include building renovation, maintenance, repair work on building systems, and routine cleaning and custodial work.

c. All tasks involving potential asbestos exposure require some degree of control. Hence, Part 12 covers the removal of even one ceiling tile in a building known to contain SAI. The degree of control is tailored to the potential of exposure to workers and to building occupants.

4. Program elements

To achieve program objectives, the ACP shall:

a. Alert building occupants to the existence and location of ACM and to the need for not disturbing it through awareness training (e.g.: Hazard Communication, etc.).

b. Establish appropriate work practices for cleaning and maintaining the buildings.

c. Establish procedures for minimizing ACM disturbances during demolition and renovation projects.

d. Establish procedures for removing ACM.

e. Establish procedures for collecting and removing fibers after a release episode.

f. Establish procedures for those workers exposed at, or above, the action level for medical surveillance, training, and compliance with the existing respiratory protection program.

5. Alternate procedures

Use procedures specified in Part 12 for all asbestos-related activities at JSC. If specified procedures cannot be used because conditions significantly vary from those for which the Part 12 procedures were developed, make a written request to the APM (JE) providing details of the problem encountered, the recommended alternatives, and a project design. The procedures provided in the project design shall provide protection equivalent to or greater than the procedures they replace. The APM shall approve any project design for an alternate procedure in writing.

6. Other asbestos-related activities

Asbestos-related activities not specified in Part 12 or those outside the limiting scope of an existing procedure require the development of a project design, including health and safety procedures. The JSC APM or his or her designated representative shall approve the design.

Chapter 12.3
Asbestos Control Program

1. Purpose

The purpose of the ACP is to provide a safe work environment by maintaining potential asbestos exposure hazards as low as reasonably achievable for all building occupants and service personnel. This can be achieved through a well-defined ACP that includes asbestos inspection, hazard assessment, and response actions and by ensuring that all JSC asbestos-related work follows the requirements set forth in the remaining chapters of Part 12. Other important aspects of a comprehensive ACP include employee training (Chapter 12.5), medical surveillance (Chapter 12.5), personal protection (Chapter 12.5), work practices and procedures (Chapters 12.3 through 12.13), air and exposure monitoring (Chapter 12.8), waste disposal (Chapter 12.14), and SOPs (Chapter 12.15 and the attachments in Appendix 12B).

This chapter defines the specific procedures for identifying and assessing ACM, developing appropriate response actions for mitigating its hazard potential, and conducting annual ambient air monitoring.

2. Responsibilities

The APM (JE) has primary responsibility for coordinating the ACP. He or she will use the services and support of both the OHD and facilities maintenance FSS contractor to implement the ACP.

3. Objectives

The primary objectives of the ACP are to:

a. Identify the locations(s), type(s), and quantity of ACM.

b. Inspect and periodically re-inspect to determine the physical condition of existing or suspect ACM.

c. Assess the hazard potential posed by existing or suspect ACM based on a set of standard criteria.

d. Perform routine annual ambient air sampling.

e. Develop and implement response actions to abate existing and potential ACM contamination.

f. Respond to emergencies and fiber release episodes.

g. Prevent future contamination through minimization of ACM disturbance and damage.

4. ACM inspections and hazard assessments

The APM will ensure that periodic inspection and hazard assessment of suspect or confirmed ACM is accomplished in JSC facilities. The hazard assessment process uses the information contained in the inspection report and involves evaluating the degree of hazard potential that exists based on a set of criteria. The inspection or assessment process provides guidance in anticipating response actions; preparing scopes of work, cost estimates, and schedules; and in developing and prioritizing an overall asbestos management plan.

5. Bulk sampling

Bulk sampling verifies the presence or absence of asbestos in a particular building or facility material. At JSC, the ACM of primary concern is the SAI or fireproofing on the structural members and decking, but you may also find ACM in a wide variety of other building materials. The following requirements apply:

a. You shall presume the presence of asbestos in the absence of bulk sample analysis confirmation for all suspect ACM.

b. Collecting bulk samples of ACM can cause significant damage and fiber release. Therefore, only individuals designated by the APM, who are trained in the proper sampling techniques, will be allowed to collect samples. The APM has designated both the OHD and the FSS contractor's industrial hygiene staff as having trained personnel to perform this sampling. Other contractors shall request this designation from the APM.

c. Analyze bulk samples by EPA-approved methods listed in 40 CFR 763.

d. All individuals shall wear respiratory protection while obtaining bulk samples of suspect ACM to prevent inhaling fibers.

6. Routine building ambient air sampling

The following air sampling occurs at JSC:

a. ***Annual and quarterly ambient air sampling*** – The OHD has been conducting routine annual and quarterly ambient air sampling at JSC for a number of years. The ambient air sampling has been conducted in buildings known to have ACM SAI and exposed ACM asbestos acoustic or decorative material.

   The data collected from this effort has shown that ***no*** significant quantity of airborne asbestos fibers exists within JSC facilities and that levels are far below EPA and OSHA limits.

   The OHD conducts this monitoring in those areas readily accessible to site personnel. The OHD performs ambient air monitoring at least annually in each of the JSC buildings known to contain ACM SAI or ACM ceiling tiles. The OHD performs ambient air monitoring at least quarterly in buildings and areas with exposed ACM acoustical or decoration materials or exposed ACM SAI.

b. ***Asbestos abatement project air sampling*** – The OHD has primary responsibility for air sampling during asbestos abatement projects and particularly the final clearance air sampling. The abatement contractor or an outside consultant conduct personnel and other air sampling during the performance of a particular project, as required.

c. The OHD collects and analyzes all ambient air samples using NIOSH Method 7400 or 7402. As the OHD obtains additional sample data, the results are added to the existing database. For additional information about air sampling requirements, refer to Chapter 12.8 of this handbook.

7. Response actions

You shall follow these requirements for asbestos response:

a. The APM (JE) is responsible for all response actions. The EPA has defined "response action" to mean "a method including removal, encapsulation, permanent enclosure, repair, operations and maintenance that protects human health and the environment from friable ACBM" (40 CFR 763).

b. At JSC, trained workers will perform one of the following four types of responses when notified about damaged ACM or when notified of a minor or major fiber release:

1. ***Cleanup of ACM*** – This response is appropriate when loose ACM dust or debris is encountered. This is a nonemergency, scheduled activity that is normally completed within 48 hours from notification.

2. ***Repair of ACM*** – This response is appropriate whenever ACM is found in a damaged, delaminated, or deteriorated condition over a relatively small area.

3. ***Removal of ACM*** – This response is appropriate whenever ACM is found in a damaged, delaminated, or deteriorated condition over a relatively large area and poses a potential exposure hazard to building occupants. In addition to removing asbestos due to its condition or hazard potential, it shall also be removed before any construction, renovation, or demolition in structures containing friable asbestos or asbestos that will be made friable by these activities. In addition, no asbestos removal in excess of 160 square feet of surfacing material or 260 linear feet of pipe insulation or 35 cubic feet of any ACM will be performed without prior written notification to the Texas Department of State Health Services (TDSHS) (see Chapter 12.6).

4. ***Emergency response*** – Cleanup and containment of a spill or release of known or suspected ACM that presents a potential hazard to building occupants. The APM (JE) is notified of any emergency involving significant damage to ACM resulting in the release of asbestos fibers. This type of situation is referred to as a fiber release episode. Upon notification, the APM coordinates response actions with the OHD and facilities maintenance FSS contractor. The situation will be evaluated and appropriate actions will be taken. These actions may include cleanup, repair, or removal of ACM as dictated by the particular circumstances.

c. All personnel are instructed to call the site EOC numbers to report suspected asbestos debris. The EOC numbers are x33333 for JSC, Sonny Carter Training Facility, and Ellington Field. The EOC will contact the JSC Environmental Spill Team for cleanup and containment and the OHD for hazard assessment and air monitoring.

8. Prohibited activities

To minimize the potential for exposure to asbestos, all ***uncontrolled*** activities that may damage ACM or PACM or cause the release of airborne asbestos fibers are prohibited. All personnel shall NEVER:

a. Cut or drill holes in any ACM or PACM.

b. Install hangers or fasteners in any ACM or PACM.

c. Sand, grind, drill, remove, or damage any ACM or PACM including floor tiles, carpet tiles, or adhesives used on these tiles.

d. Damage ACM or PACM while moving equipment or furniture.

e. Install curtains, drapes, or dividers in such a manner that they will damage ACM or PACM.

f. Use an ordinary vacuum or compressed air or dry sweeping to clean up ACM or PACM debris.

g. Remove ceiling tiles below ACM or PACM without following the procedures set forth in Part 12.

h. Hang any item from the suspended ceiling grid below a ceiling plenum with SAI.

i. Damage any pipe or mechanical system insulation that contains or could contain ACM or PACM. Insulating materials such as Styrofoam, foam rubber, foam glass, or fiberglass do not contain asbestos; however, ACM may exist at the joints and fittings. Contact the APM before conducting activities that may cause disturbance or damage to these materials or follow the applicable procedure in Appendix 12B, Attachments 12A through 12G.

Chapter 12.3
Asbestos Control Regulations

1. Introduction

Medical evidence linking asbestos to chronic disease has led to efforts to control or reduce asbestos exposure, particularly in environmental and occupational settings where exposure can be prolonged. Both OSHA and the EPA have published regulations concerning asbestos exposure. State regulatory agencies, TDSHS, and the Texas Commission on Environmental Quality (TCEQ) have become involved in administering certain aspects of the regulations. Failure to follow regulations and apply adequate standards of care in asbestos-related activities may result in unnecessary risk to employees and building occupants.

2. Occupational Safety and Health Administration

OSHA has issued two separate asbestos standards that cover the vastly different conditions in general industry and construction workplaces. These standards were established in the Code of Federal Regulations, Title 29, Part 1910, Section 1001 for general industry (29 CFR 1910.1001) and in the Code of Federal Regulations, Title 29, Part 1926, Section 1101 for the construction industry (29 CFR 1926.1101). These standards establish PELs and numerous requirements that employers need to meet. You shall use these standards in conjunction with Part 12 to ensure compliance with federal regulations. OSHA regulations cover the following:

a. Both regulations establish requirements for:

   1. Methods of compliance
   2. PPE
   3. Employee monitoring
   4. Medical surveillance
   5. Alerting employees of hazards
   6. Regulated areas
   7. Housekeeping procedures
   8. Training
   9. Recordkeeping

b. The OSHA PEL for asbestos exposure is 0.1 f/cc of air as an 8-hour TWA; OSHA also has a 30-minute TWA excursion limit of 1.0 f/cc. These limits apply to workers performing operations involving asbestos products and to construction workers performing abatement, demolition, or renovation involving ACM.

c. Additionally, 29 CFR 1926.1101 defines the classes of asbestos-related construction work. These classes are:

1. ***Class I asbestos work*:** Activities involving the removal of thermal system insulation (TSI) or surfacing material that has been identified as ACM or is presumed to be ACM (PACM).

   Note: From 29 CFR 1926.1101(b) – surfacing material means material that is sprayed, troweled on, or otherwise applied to surfaces of ceilings, structural members, and other surfaces for fireproofing, acoustical, and other purposes.

2. ***Class II asbestos work*:** Activities involving the removal of ACM that is not TSI or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard systems, floor tiles and sheeting, ceiling tiles, roofing and siding shingles, and construction mastics.

   Note: From 29 CFR 1926.1101(a)(8) – the OSHA Construction Industry Standard does not apply to asbestos-containing asphalt roof coatings, cements, and mastics.

3. ***Class III asbestos work*:** Repair and maintenance operations where ACM, including TSI and surfacing ACM and PACM, is likely to be disturbed.

   Note: From 29 CFR 1926.1101(b) – disturbance means activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount that can be contained in one standard-size glove bag or waste bag, to access a building component. The amount of ACM or PACM disturbed shall never exceed that which can be contained in one glove bag or waste bag, not to exceed 60 inches in length and width.

4. ***Class IV asbestos work*:** Maintenance and custodial activities during which employees contact but do not disturb ACM and activities to clean up dust, waste, and debris from Class I, II, and III activities.

d. In addition to the asbestos standards, OSHA has also issued other standards related to specific safe work practices. Most notable of these is 29 CFR 1910.134, "Respiratory Protection." Both 29 CFR 1910.1001 and 29 CFR 1926.1101 reference this standard. Any employer requiring workers to wear respiratory protection shall meet the requirements of 29 CFR 1910.134. This includes a written Respiratory Protection Program plan reviewed by the NASA-JSC Occupational Health Officer or his/her designated representative.

3. Environmental Protection Agency

Two sets of EPA regulations affect activities at JSC involving ACM:

a. In the first, the EPA regulates asbestos as a hazardous pollutant under the Clean Air Act. The standard, NESHAP, was established in the Code of Federal Regulations, Title 40, Chapter 1, Subchapter C, Part 61, Subpart M, paragraphs 140 through 157 (40 CFR 61 Parts 140–157). Both building owners and asbestos-removal operators are responsible for complying with the standard. The standard:

   1. Requires that a thorough inspection for ACM be performed in building and facilities to be demolished or renovated.
   2. Requires notification to the EPA when a building or facility, or a portion thereof, is to be demolished regardless of the presence or lack of identified ACM.
   3. Requires that the EPA be notified when a building that contains friable or potentially friable ACM is to be renovated if the amount of the material disturbed meets notification limits.
   4. Sets standards for wet removal and treatment of asbestos materials during building demolition and renovation.
   5. Prohibits the spray application of materials that contain greater than 1% asbestos.
   6. Prohibits the use of molded and friable or wet-applied asbestos materials.
   7. Sets procedures for air cleaning and for inactive and active waste disposal sites.
   8. Prohibits visible emissions to the outside.
   9. Specifies certain disposal procedures.

   This EPA regulation focuses on the removal of ACM during demolition and renovation activities in buildings, emission of asbestos fibers, and disposal of asbestos waste. The standards are related to environmental controls, not to worker protection. This EPA standard, which governs emission of asbestos fibers into the atmosphere, stipulates that there shall be no visible emissions from any asbestos-using operation, waste disposal site, or sanitary landfill. It also requires a variety of dust-suppressing procedures. Special procedures relating to roof removal may be found in 40 CFR 61, Appendix A—Interpretive Rule Governing Roof Removal Operations.

b. The second set of EPA regulations is "Asbestos-containing Materials in Schools" (40 CFR 763), which was promulgated under the Toxic Substances Control Act. While this regulation was aimed primarily at ACM in schools, it has become a standard for accepted practice. This regulation also states that response actions are completed when clearance air samples have fiber concentrations of ≤ 0.01 f/cc of air. Changes to this regulation in 1994 modified training requirements and added applicability to public and commercial buildings, including government-owned buildings. The OSHA regulations refer to 40 CFR 763 in some of their criteria, especially for training requirements.

4. Texas Department of State Health Services

Texas has enacted an asbestos contractor licensing law that can be found in the Texas Administrative Code (TAC). You can find these requirements in Title 25, Part 1, Chapter 295, paragraphs 31 through 73 (25 TAC 295.31–295.73). Any contractor performing asbestos-related work in public buildings shall have appropriately trained and licensed personnel planning, supervising, and conducting the work. The TDSHS also has primary responsibility within the state for enforcement of EPA NESHAP regulations under authority delegated by the EPA.

5. Texas Commission on Environmental Quality

The TCEQ has established requirements for the disposal of asbestos waste. Texas has designated ACM as a Class I waste. You can find this designation in Title 30, Part 1, Chapter 335, subchapter R, paragraphs 501 through 521 (30 TAC 335.501–335.521). Dispose of any ACM waste generated at JSC per all Texas requirements found in 30 TAC 335, "Industrial Solid Waste and Municipal Solid Waste."

6. Harris County

The Harris County Health and Environmental Department has issued no asbestos control regulations.

7. City of Houston

The City of Houston has issued no asbestos control regulations that apply to activities on federal property.

8. NASA Policy

NASA Headquarters, in a February 18, 1983 letter on "Hazard Assessment and Abatement in NASA Buildings," summarized its position with respect to the presence of asbestos in NASA facilities:

a. Asbestos SAI shall not be removed from surfaces of NASA buildings simply because of its presence, neither should other abatement techniques be implemented.

b. All areas containing asbestos SAI shall be visually inspected at least annually for damage and signs of deterioration.

c. Air sampling and analysis for airborne fibers shall be performed annually or more frequently, as warranted, in areas containing asbestos SAI.

d. Where hazard assessments reveal asbestos SAI to be in an unacceptable condition so that the health of building occupants may be threatened, corrective actions shall be taken promptly to eliminate or control the source of contamination.

e. Accurate and up-to-date records shall be maintained of all asbestos identification, work area surveillance, and abatement activities.

f. Employees shall have access to these records per OSHA requirements.

g. Access to medical surveillance records shall follow NASA Privacy Regulations on Medical Records.

9. JSC Policy

JSC's policy is to meet or exceed all of the above requirements. Part 12 and federal, state, and local regulations form the basis of the requirements for all asbestos-related activities undertaken at JSC. JSC expects any organization or contractor performing asbestos-related work at the center to also meet or exceed these same requirements. To ensure familiarity with the requirements, JSC requires that any organization, activity, or contractor performing asbestos-related work at the center have in their possession copies of Part 12 of this handbook as well as the following standards:

a. 29 CFR 1910.1001

b. 29 CFR 1926.1101

c. 29 CFR 1910.134

d. 40 CFR 61.140– 61.157

e. 40 CFR 763

Chapter 12.5
General Asbestos Work Requirements

1. What this chapter covers:

This chapter covers the following general requirements for any asbestos work at JSC, to include:

a. Medical surveillance requirements.

b. Training requirements.

c. Respiratory protection requirements.

d. Personal protective clothing and equipment.

e. Decontamination.

f. Secure electrical, fire, and HVAC systems.

g. Electrical power hazards.

h. Slips, trips, and falls.

i. Confined spaces.

j. Ladders and scaffolds.

k. Heat stress.

l. Prohibited activities.

2. Medical surveillance requirements

You shall follow these requirements for medical surveillance:

a. You can find medical surveillance requirements in three OSHA regulations. Refer to the listed regulations for details and specifications of these requirements. Note that all three regulations require a physician's written opinion. These three regulations are:

1. 29 CFR 1926.1101, "Construction Industry Standard for Asbestos," requires employees who perform Class I, II, and III asbestos work for 30 or more days per year, or those who are exposed to airborne concentrations of asbestos at or above the PEL, to be enrolled in a medical surveillance program. Medical examinations are required before asbestos work or exposure (pre-placement) and annually thereafter.

2. 29 CFR 1910.1001, "General Industry Standard for Asbestos," requires all employees who are exposed to airborne concentrations of asbestos at or above the PEL to be enrolled in a medical surveillance program. Medical examinations are required before asbestos work or exposure (pre-placement), annually, and upon termination of employment.

3. 29 CFR 1910.134, "Respiratory Protection Standard," specifies that any employee required to wear respiratory protection equipment while performing his or her job

shall receive a medical evaluation. Medical examinations are required to determine an employee's ability to use a respirator before that employee is fit tested or required to use a respirator.

b. The frequency of medical evaluations for asbestos workers and respirator wearers at JSC is also listed in Chapter 3.6 of this handbook.

c. The medical support contractor provides medical surveillance of JSC civil service employees. On-site resident support contractor employees receive medical surveillance as specified in their contract. Fixed-price contractors shall provide the required medical surveillance from medical resources other than JSC.

d. No ambient levels of asbestos fibers have been identified within JSC facilities that would expose building occupants to even a significant fraction of the JSC action level. Therefore, no requirement exists for building occupants to be placed on an asbestos-related medical surveillance program.

3. Training requirements

When an entire area is turned over to a contractor, who was hired for Class I or Class II asbestos abatement of a building a floor, or a room; the contractor's asbestos workers are not required to take JSC site specific training. However, the workers shall be current in their Class I or Class II asbestos training, as described below. If off-site contractors are performing spot scrapes or some other type of small scale Class I, II work or Class III work, where other JSC employees are present, then the offsite contractor's asbestos workers are required to take a two hour JSC site specific training course described below and are expected to follow the pre-approved project designs listed in Chapter 12.15 and Appendix 12B. Competent persons for off-site contractors shall meet the requirements of Chapter 12.7.

The following subparagraphs list the JSC minimum training requirements for Class I, II, III, and IV asbestos work. The OSHA Construction Industry Standard for Asbestos, 29 CFR 1926.1101(k)(9), provides the basis for this training. Complete the training for your appropriate class of asbestos work before or at the time of your initial assignment and take refresher training at least annually thereafter. Training requirements are as follows:

a. ***All Class I work***: Training equivalent to the EPA Model Accreditation Plan asbestos abatement worker training specified in 40 CFR 763, Subpart E, Appendix C. This is a 4-day training class that includes specific lecture topics and demonstrations, hands-on training, a current individual respirator fit test, a course review, and a written test. Individuals who possess a current certificate issued under 25 TAC 295.42 for an Asbestos Abatement Worker have demonstrated that they have met this requirement. Currency in this training expires exactly 12 months after the date of the initial or last refresher training, and individuals may not perform Class I work activities until they have again received the required 8-hour refresher training. Any individual who lets more than 24 months lapse since the date of his or her last training shall retake the 4-day initial training.

b. ***Class II work that uses critical barriers or negative pressure enclosures***: Training equivalent to the EPA Model Accreditation Plan asbestos abatement worker training

specified in 40 CFR 763, Subpart E, Appendix C. This is a 4-day training class that includes specific lecture topics and demonstrations, hands-on training, a current individual respirator fit test, a course review, and a written test. Individuals who possess a current certificate issued under 25 TAC 295.42 for an Asbestos Abatement Worker have demonstrated that they have met this requirement. Currency in this training expires exactly 12 months after the date of the initial or last refresher training, and individuals may not perform Class II work activities until they have again received the required 8-hour refresher training. Any individual who lets more than 24 months lapse since the date of his or her last training shall retake the 4-day initial training.

c. ***All other Class II work***: Only for work involving ACM roofing materials, flooring materials, siding materials, ceiling tiles, or transite; training shall meet these requirements:

   1. Be equivalent to the requirements specified in 29 CFR 1926.1101(k)(9)(iv).
   2. Include specific topics listed in 29 CFR 1926.1101(k)(9)(viii) and work practices or procedures from 29 CFR 1926.1101(g).
   3. Take a minimum of 8 hours.
   4. Currency in this training expires exactly 12 months after the date of the initial or last refresher training; individuals may not perform Class II work activities until they have again received refresher training. Any individual who lets more than 24 months lapse since the date of his or her last training shall retake the initial training.
   5. These workers shall also have a current respirator fit test.

d. ***Class III work and Class IV emergency response work***: Training shall meet these requirements:

   1. Be equivalent to the requirements specified in 29 CFR 1926.1101(k)(9)(v) and 40 CFR 793.92(a)(2). This 16-hour training class includes specific topics, work practices, respiratory protection, and hands-on training.
   2. Currency in this training expires 12 months after the date of the initial or last refresher training. Individuals who can demonstrate that they are scheduled for refresher training may continue to perform Class III and Class IV emergency response asbestos-related work on site at JSC until receiving the scheduled refresher training, but not longer than 14 months after the date of their last training.
   3. Any individual who lets more than 24 months lapse since the date of his or her last training shall retake the initial training.
   4. These workers shall also have a current respirator fit test.
   5. When emergency response involves a cleanup of a major fiber release episode, the responders shall have training meeting the requirements of Class I asbestos work (see above).

e. ***Restricted Class III asbestos operations and maintenance work***: All employees (contractor or civil service) at JSC who work in ceiling plenums or mechanical rooms,

beneath computer floors, and anywhere that ACM could potentially be disturbed shall complete the 8-hour JSC "Class III Asbestos Operations and Maintenance (O&M) (Restricted)" course offered by the OHD. This course, along with medical surveillance or evaluation and a current respirator fit test, is required before conducting restricted Class III activities at JSC. Refresher training requires completion of the 2-hour JSC "Class III Asbestos Operations and Maintenance (O&M) (Restricted) (Refresher)" course offered by the OHD. Additional discussion about this JSC training is provided below:

1. The work is considered restricted because it is limited to the specific areas and specific conditions at JSC where activities have the potential to disturb asbestos-containing SAI or to disturb dirt or dust containing SAI debris, The asbestos work is restricted because it ***does not*** include removal or abatement of any ACM. This encompasses work in ceiling plenums or mechanical rooms, beneath computer floors, and anywhere that ACM could potentially be disturbed. For example, entry into ceiling plenums to "pull cables" or install electrical utility lines in buildings with SAI falls under this classification.
2. The JSC Class III Asbestos O&M (Restricted) initial and refresher courses neither address nor train workers to perform the other types of Class III asbestos-related work, such as glovebag removal or spot abatement of ACM. If you perform actual removal of ACM for operations and maintenance activities, you shall meet the appropriate training requirements for asbestos Class I, II, or III work as described in the paragraphs above.
3. The JSC Class III Asbestos O&M (Restricted) course is required for all on-site workers performing this type of work on site at JSC since it acquaints them with the conditions found at JSC. An exception exists for off-site contractors, see paragraph 3.h. below.
4. Currency in the JSC Class III Asbestos O&M (Restricted) training expires 12 months after the date of the initial or last refresher training. Individuals who can demonstrate that they are scheduled for refresher training from OHD may continue to perform restricted Class III asbestos-related operations and maintenance work on site at JSC until receiving the scheduled refresher training, but not longer than 14 months after the date of their last training. If you let more than 24 months lapse since the date of your last training, you shall retake the initial training.

f. ***Class IV work (except emergency response)***: Training equivalent to the requirements specified in 29 CFR 1926.1101(k)(9)(vi) and 40 CFR 793.92(a)(2). This 2-hour awareness training class includes specific topics and work practices. If you are involved in housekeeping and custodial activities at JSC in areas with ACM (e.g., acoustical or decorative treatments and flooring materials), you shall meet this training requirement. If you are a JSC custodial worker, use HEPA vacuum cleaners and methods to avoid the generation of asbestos fibers from flooring materials as referenced in 29 CFR 1910.1001(k) and 29 CFR 1926.1101(l).

g. ***Resilient Floor Covering Institute (RFCI)***: Training in the methods specified by the RFCI for the removal of resilient floor coverings and adhesives that contain asbestos.

These floor coverings may be: (i) sheet flooring that contains asbestos or has an asbestos felt backing, (ii) vinyl or asphalt floor tiles, or (iii) adhesives and mastics. Individuals removing floor coverings and adhesives using RFCI methods at JSC shall also have Class II (32-hour) or Class III (16-hour) asbestos training as required by the activity. Training in RFCI methods shall last a minimum of 8-hours. The specific RFCI methods may be found in the RFCI document "Recommended Work Practices for Removal of Resilient Floor Coverings" at http://www.rfci.com/index.php . See the TDSHS statement concerning RFCI procedures at http://www.dshs.state.tx.us/asbestos/pdf/ARC022.pdf.

h. ***JSC Site Specific Training for Off-Site Contractors Conducting Class I, Class II, and Class III Asbestos Work***: When off-site contractors conduct small scale Class I/ II work or Class III work using the pre-approved project designs described in Chapter 12.15 and Appendix 12B, where other JSC employees are present, their employees shall take a 2-hour OHD training course to acquaint them with JSC conditions, JSC procedures, and job-specific performance requirements described in Chapter 12.15. OHD will offer this course only by request from the contractor. The contractor's workers must provide proof of currency in Class I or Class II training (32-hour) or Class III O&M Training (16 hour) either before the course start date or at the time of the course.

i. Training for any employees likely to be exposed above the PELs for asbestos shall meet the minimum training requirements specified in both 29 CFR 1910.1001(j)(7) and 29 CFR 1926.1101(k)(vii) and (viii).

j. Training for employees required to wear respiratory protection for any level of work involving asbestos materials shall meet the requirements of 29 CFR 1910.134.

k. Fixed-price contractors subject to these training requirements shall provide documented proof of required training for their workers and supervisors before proceeding with work identified within Part 12.

l. Building occupants shall receive asbestos awareness training through the annual JSC requirement for Hazard Communication Training.

4. Respiratory protection requirements

The following requirements apply for respiratory protection:

a. JSC policy requires the use of respirators when they are necessary to protect the health of the employee and reduce the risk of asbestos exposure during asbestos-related activities. Locate the basic OSHA requirements in 29 CFR 1910.134; they are also referenced in this handbook. If you wear respiratory protection for any level of asbestos work, you shall have an annual individual respirator fit test.

b. JSC provides respirators at no cost to civil service employees. Respiratory protection for on-site support contractor employees will be provided as specified in their contract. Fixed-price contractors subject to these requirements shall furnish their own equipment and provide documented proof of fit testing, medical surveillance, and training for their workers and supervisors before proceeding with work identified within Part 12.

c. If you perform any Class I, II, or III asbestos work at JSC, you shall wear appropriate respiratory protection. If you perform Class IV asbestos work, you may be required to wear respiratory protection. Select respirators based on the requirements stated in either 29 CFR 1926.1101(h) or 29 CFR 1910.1001(g).

d. Any employer requiring employees to wear respiratory protection shall develop a written Respiratory Protection Program plan meeting the criteria detailed in 29 CFR 1910.134.

e. The JSC Clinical Services Branch designated representative shall approve the written Respiratory Protection Program plan.

f. Select all respiratory protection devices from those approved by NIOSH. Workers performing asbestos activities are prohibited from wearing a filtering face-piece respirator. If you must wear a respirator, you shall not wear a beard or other facial hair that would interfere with the facial seal with the face piece. Any job superintendent, a designated competent person, or a Certified Industrial Hygienist who determines that an employee's existing facial hair prevents the effective use of a respirator shall not allow the employee to work at any job requiring a respirator until the facial hair is removed. See Chapter 5.6 of this handbook for contact lens use.

g. Eyeglasses require special mounts inside full-face respirators. Under no conditions allow eyeglass temple pieces to penetrate the face seal of the respirator. Any breathing air for supplied air respirators or self-contained breathing apparatus shall meet Grade D breathing air specification of 29 CFR 1910.134.

5. Personal protective clothing and equipment

You shall follow these requirements to protect yourself:

a. Provide personal protective clothing and equipment required for employees engaged in asbestos-related activities as specified in Part 12. You can find basic information on PPE in this handbook. If workers are exposed to hazardous noise, they may also find information on hearing protection in this handbook. Additionally, you can find OSHA requirements on PPE in the following standards:

- 29 CFR 1910.132, "General Requirements for Personal Protective Equipment"
- 29 CFR 1910.133, "Eye and Face Protection"
- 29 CFR 1910.135, "Head Protection"
- 29 CFR 1910.136, "Foot Protection"
- 29 CFR 1910.138, "Hand Protection"
- 29 CFR 1910.95, "Occupational Noise Exposure"

b. Wear protective clothing and equipment during asbestos-related work to protect from gross contamination of the body, hair, etc., and to provide protection from other physical hazards in the workplace. The proper use of protective clothing, coupled with the appropriate use of decontamination showers, as required, and HEPA-filtered vacuum

cleaners, will minimize your chance of bringing asbestos out of the work area and into your general environment and home.

c. Use protective equipment, such as hard hats and eye protection, in those activities in which there is risk of head injury from falling objects or eye injury from foreign objects. If you're required to wear a half-mask respirator, you shall wear safety glasses with side shields or safety goggles.

d. If you work in areas where there is a possible danger of head injury from impact, falling or flying objects, or electrical shock or burns, you shall wear a protective helmet as determined by the designated competent person, the job supervisor, or the JSC Safety and Test Operations Division.

e. Protective clothing does not include street clothes (or shoes), T-shirts, blue jeans, sweatbands, kneepads, and socks. If you use any of these items inside the work area, you shall remain there until the job is completed and either be decontaminated using HEPA-filtered vacuum cleaners or wet wiping, or alternatively have these items disposed of as asbestos-contaminated waste.

f. Keep other protective clothing or items, such as hard hats and safety shoes or boots, if required, or other appropriate footwear in the work area for the duration of the project. Upon project completion, you can clean these items, place them in a plastic bag, label them as asbestos contaminated, and take them to the next project. If these items cannot be decontaminated, dispose of them at the end of the project as asbestos-containing waste.

g. Protective clothing for asbestos-related work shall consist of disposable coveralls and gloves. These coveralls are normally paper or a synthetic material (i.e., Tyvek) with built-in or attached hoods and booties. Do not cut the hood or booties from the coveralls. After each use, discard these items as asbestos-contaminated waste. Disposable coveralls, such as Tyvek, are extremely vulnerable to hot surfaces or open flames. They burn rapidly, and some plastic materials may melt and severely damage exposed skin.

6. Decontamination

You shall follow these requirements for decontamination after asbestos work:

a. Visible signs of asbestos will not be tolerated in areas serving building occupants. Therefore, everyone shall go through the decontamination sequence after leaving a regulated asbestos work area for any reason.

b. The degree of decontamination necessary is directly proportional to the potential of exposing someone outside the work area. For the majority of JSC jobs, where disposable clothing is worn and where an enclosure is not required, first use a HEPA-filtered vacuum on or wet wipe the protective clothing, then carefully remove the protective clothing and bag it as asbestos-containing waste. Bag contaminated materials for disposal as asbestos waste.

c. When it is necessary to work within a large enclosure, in-process through a "hygiene unit" or "clean room" to change from street clothes into work clothes and out-process through the decontamination or hygiene units to remove contaminated work clothing, decontaminate, and change back into street clothes.

7. Secure electrical, fire alarm, and HVAC systems

You shall take the following actions to secure critical systems before starting asbestos work:

a. Secure or deactivate all electrical, fire alarm, and HVAC systems in the work area before a major abatement activity, especially when it is necessary to construct a large enclosure. Activities involving small-scale or incidental asbestos exposure will generally not require securing the electrical, fire alarm, or HVAC systems; however, you will need to evaluate this on a case-by-case basis. Regardless, you shall coordinate any outage of electrical or HVAC systems through work control using established procedures.

b. The amended water used to saturate ACM creates a humid environment. To eliminate the potential hazard, you shall de-energize the electrical systems serving the work area and control their operation before any wet operations begin.

c. Fire alarm sensors are triggered during abatement activities. You shall disable them before and throughout the project and have the Fire Protection Coordination Office approve all fire alarm sensor outages.

d. The HVAC system, if left operational in an asbestos work area, represents a potential route and means for spreading ACM fibers into other areas of the facility and, therefore, increases the risk of employee exposure. You shall shut down, isolate, and control the HVAC in the work area before and during any asbestos-related activity.

e. All vents and air ducts inside the work area shall be covered and sealed with two layers of 6-mil plastic and tape.

f. If the HVAC system supplying the work area supplies other areas in the building that are still operational, de-energizing the system may not be feasible; you shall develop an alternate method of isolating the work area portion of the HVAC.

g. Control electrical and HVAC systems shut down or de-energized at the point of isolation with an orange JSC Form 19A, "WARNING – DO NOT OPERATE" tag, and a lock (the lock shall be a color other than red). Use this tag and the operation or energy control procedures found in Chapter 8.2 of this handbook to ensure the systems are controlled.

8. Electrical power hazards

One of the most common hazards, and one that gives the least warning, is electrical power. Incorrect wiring, improper grounding, and lack of proper shielding in the wet environment of asbestos-related activities can significantly increase workers' risk. To lessen the risk of injury, you shall refer to the requirements in this handbook and take the following actions:

a. De-energize as much of the work electrical system as possible.

b. Use portable light systems.

c. Use nonconductive scrapers, tools, and vacuum attachments.

d. Use hot-line covers over energized cables and power lines when possible.

e. Use caution to avoid damaging power cable insulation with scrapers, shovels, scaffolding, and wheeled equipment.

f. Avoid stringing electrical wiring across floors. Elevate wiring, if possible, to keep it away from litter on the floor, physical abuse, and damage from equipment use.

g. Use stable, wooden or fiberglass ladders – not metal.

h. Consider electrical equipment and lines to be energized unless tested and determined otherwise.

i. Extension cords used with portable electric tools and appliances shall be of the three-wire type and connected to a GFCI.

j. All 120-volt, single-phase, 15- and 20-ampere receptacle outlets in the work area that are not part of the permanent wiring of the building or structure shall be equipped with an approved GFCI.

k. Establish and implement an assured equipment grounding conductor program covering all cord sets and receptacles that are not part of the permanent wiring of the building or structure, and equipment connected by cord and plug, which is available for use or used by employees on asbestos-related activities covered by Part 12.

9. Slips, trips, and falls

Asbestos-related projects, particularly abatement projects, are inherently dangerous for numerous reasons: the presence of multiple layers of plastic sheeting on the floor, the accumulation of debris, poor lighting, and the need to work from ladders and scaffolds. To deal with these problems, you shall take steps to prevent slips and falls in the work areas:

a. Install the first layer of floor sheeting as tight and flat as possible. Secure the second layer of plastic to the first with tape, spray adhesive, or other means. (This will reduce the chance of the two layers sliding over one another.)

b. Keep electrical lines off the work floor by taping them high on the wall, behind the wall plastic if possible.

c. Do not allow debris from abatement activities to pile up or lay about. Pick up and place the material in appropriate containers at the time of generation.

d. Select a secure area out of the normal traffic pattern for the temporary storage of waste bags.

e. For plastic floor sheeting on stairs, install a nonskid surface over the plastic on each tread. Do not cover stairs unless they require protection from water damage.

f. Ensure that all workers in the work area wear a good-quality protective shoe or boot. Rubber boots that provide good traction are preferred. Rubber boots also provide some protection from electrical shock as well as being easy to clean. Workers should not wear Tyvek booties on the outside of their work shoes.

g. Always follow established procedures for the installation and use of ladders and scaffolds.

h. Most abatement work requires that the worker be constantly looking at the ceiling or pipes overhead. Thus, every worker shall always be on the lookout for tools, cable equipment, etc., left lying about the work area that may trip them as they move about.

10. Confined spaces

Confined spaces may be encountered in asbestos-related activities. *A confined space is a space that, by design, has limited openings for entry and exit; that has unfavorable natural ventilation, which could contain asbestos fibers, other hazardous materials or is oxygen deficient; and that is not intended for continuous employee occupancy.* Confined spaces can include, but are not limited to, storage tanks, process vessels, pits, vats, degreasers, security vaults, boilers, underground utility tunnels or vaults, and pipelines. This handbook and the OSHA requirements in 29 CFR 1910.146 govern entry into confined spaces during asbestos-related activities. Anyone working in a confined space at JSC shall complete the JSC Confined Space Training Course at the JSC Safety Learning Center or the Houston Area Safety Council before working in a confined space at JSC. Any asbestos-related work in a confined space, including the underground utility tunnels, requires a confined space procedure and permit approved by the OHD and the Safety and Fire Protection contractor. See Chapter 6.10 of this handbook for more information.

11. Ladders and scaffolds

Asbestos-related activities specified in Part 12 routinely use ladders and scaffolds. Both items represent potential safety hazards. Use ladders and scaffolds at JSC per the requirements of this handbook, and the OSHA requirements of 29 CFR 1910.25, 29 CFR 1910.26, 29 CFR 1926.450–454, and 29 CFR 1926.1053.

12. Heat stress

You shall take the following measures to control heat stress:

a. Control employees' total heat exposure when conducting JSC asbestos-related activities so that workers are not exposed to combinations of metabolic and environmental heat, which produce unacceptable heat stress. Heat stress, for the purpose of Part 12, is the total effect of environmental and physical factors that makes up the total heat load imposed on the body. Unacceptable heat stress is defined as any combination of metabolic and environmental heat, which produces any symptom or adverse effect.

b. Several biological effects can occur from heat stress. They include, in increasing order of severity, heat rash, heat cramp, heat exhaustion, and heatstroke. Heatstroke is an acute medical emergency that requires immediate medical attention. If you are a work area supervisor, you shall be familiar with the signs and symptoms of these conditions and take appropriate action whenever any worker shows signs of heat stress.

c. The major factors affecting heat exchange between a person and the environment are air temperature and humidity, skin temperature, air velocity, evaporation of sweat, and radiant temperature, as well as type, amount, and characteristics of clothing. Summer weather in Houston is both hot and humid.

d. Protective clothing required for asbestos-related activities serves as a barrier against gross contamination of the body by asbestos materials and the potential spread of asbestos to uncontrolled environments. It also alters the rate and amount of heat exchange between the skin and the ambient air, thus increasing the stress of metabolic and environmental heat.

e. The effects of heat stress can be increased if the individual is using alcohol, therapeutic drugs, or social drugs while being exposed to high heat stress in the work environment. Many drugs prescribed for therapeutic purposes also affect the body's mechanisms for adapting and adjusting to heat stress. If you require therapeutic medication, you may not work asbestos-related activities that may promote heat stress unless you are under the supervision of a physician who provides a written opinion that you will not be adversely affected by the heat stress of the proposed work activity.

f. To the extent possible, only employees acclimated to heat stress will be used in asbestos-related activities requiring full protective clothing and work area enclosures.

13. Prohibited activities

While in a regulated asbestos work area, you shall NEVER:

a. Smoke

b. Eat

c. Drink

d. Chew gum or tobacco or use snuff

e. Apply cosmetics

Chapter 12.6
Notification Requirements

1. Introduction

All JSC asbestos-related activities require some level of notification as specified below. Resolve any questions or notification before beginning asbestos-related activities. Some jobs require notification of state or federal agencies before beginning them. The JSC Center Operations Directorate, Environmental Management Office (JE), makes all notifications to state or federal agencies for asbestos-related activities at JSC.

2. JSC offices to be notified

The office starting an asbestos job shall notify the following JSC offices of proposed or planned asbestos-related activities. Failure to provide this notification may result in delay, work stoppage, or discontinuance of the job by the APM, the Occupational Health Officer, or the NASA safety representative. Notification requirements are as follows and are summarized in Table 12.6-1:

a. Notify the facility manager and work area supervisor of all planned asbestos Class I, II, or III work in sufficient time for the facility manager or supervisor to inform building occupants.

b. Notify the OHD, either orally (x36726) or by fax (x33395), before all asbestos Class I, II, and III activities as well as for any Class IV asbestos emergency response cleanup activities. Use JF664, "Job Procedures Requirements Permit and Notification," shown in Appendix 12A for written or fax notification. For telephone (oral) notification, include all information found in Table 12.6-2 at the end of this chapter.

c. Notify the JSC Environmental Office (JE), either orally (x33120) or by fax (x33048), when any asbestos Class I or II activities will cause the removal or abatement of more than 260 linear feet, 160 square feet, or 35 cubic feet of ACM; or will cause the demolition of a building or portion thereof, regardless of whether ACM has been identified or not. At least 15 working days before the start of these activities, provide the Information contained in the most current revision of Form APB#5, "TDSHS Renovation or Demolition Notification Form." You can download a copy of this form and instructions for filling it out from the TDSHS Asbestos Programs Home Page at http://www.dshs.state.tx.us/asbestos/default.shtm A link to this form is also shown in Appendix 12A.

Note: The JSC Environmental Office (JE) will make all required notifications to external state and federal governmental agencies. Additionally, JE will determine whether and when there are any exemptions for TDSHS notifications.

3. Project design requirements

The job specific performance requirement descriptions in Chapter 12.15 and Appendix 12B to this handbook are the pre-approved project designs for asbestos Class I and Class II abatement activities involving less than 260 linear feet, 160 square feet, or 35 cubic feet of ACM or PACM and for asbestos Class III activities.

If your activity will cause the demolition of a building or portion thereof, regardless of whether ACM has been identified or not; or if you perform asbestos Class I or Class II or Class III work using an Alternative Procedure under Chapter 12.2, Paragraph 5; or if you perform asbestos Class I or Class II abatement work involving the removal of ACM or PACM in an amount of equal to or greater than 260 linear feet, 160 square feet, or 35 cubic feet, you shall:

a. Provide the JSC APM with a project design before beginning work. To meet the requirements of both OSHA (under 29 CFR 1926.1101(g)) and the EPA (under 40 CFR 763.90(g)), the project design shall be reviewed and approved by an accredited project designer who meets the requirements of 40 CFR 763, Appendix C, Model Accreditation Plan.

The JSC APM or designated representative shall review and approve the project design for use at JSC. You shall not begin work until the JSC APM approves your project design.

b. Provide all information necessary for the JSC APM to make required notices to all federal, state, and local agencies responsible for enforcement of the National Emission Standard for Asbestos or other applicable regulation within the required time period. The JSC APM must receive this information at least 15 working days prior to the start of: (i) any planned abatement involving the removal of ACM or PACM in amounts equal to or greater than 260 linear feet, 160 square feet, or 35 cubic feet; or (ii) the demolition of a building or portion thereof. You shall not begin these activities until ten (10) working days after the JSC APM confirms that the required documents were filed with the TDSHS.

c. Submit a project design that:

    1. Contains documentation that required permits, site location, and arrangements for transport and disposal of asbestos-containing waste have been made, per JPR 8550.1, latest revision.

    2. Contains a detailed design outlining the sequence of events, including days or shifts per event, and procedure(s) to be followed.

    3. Contains documentation that the contractor's employees – including foremen, supervisors, competent persons, and any other company personnel or agents who may be exposed to airborne asbestos fibers or who may be responsible for any aspect of the abatement action – have received all necessary training that includes, at a minimum, the training requirements of 29 CFR 1926.1101.

    4. Contains documentation that all employees or agents who may be exposed to airborne asbestos in excess of the PEL of 29 CFR 1926.1101 or who shall wear

respiratory protection have been medically examined as required by the regulation to determine whether they are physically capable of working while wearing a respirator without suffering adverse health effects, or whether they have any condition that might be aggravated by exposure to asbestos.

5. Contains shop drawings for layout and construction of the regulated area containment systems, decontamination areas, and other barriers to isolate the work area. Drawings shall include the negative-pressure equipment location as detailed in the project specifications and required by regulation.
6. Contains manufacturer's certification that HEPA-filtered vacuums, negative-pressure ventilation units, and other local exhaust ventilation equipment conform to ANSI Z9.2-79.
7. Contains a copy of the written notification to owners of rental equipment to be used in abatement areas or to transport asbestos waste.
8. Contains documents showing NIOSH approvals for all respiratory protective devices to be used on site. If supplied-air respirators are used, document that the air source has been checked and qualified to provide breathing air meeting the requirements of the Compressed Gas Association, Specification G-7, for D-grade air.
9. Contains documentation of respirator fit testing for all contractor employees and agents who must enter the restricted or enclosed area. This fit testing shall meet the requirements of 29 CFR 1926.1101 and 29 CFR 1910.134, as a minimum.
10. Contains necessary documentation to demonstrate compliance with the applicable paragraphs of Part 12 and applicable federal, state, and local regulatory requirements.

d. Ensure the contractor performing the asbestos work complies with the approved project design.

e. Ensure that any changes to a building demolition (total or partial) or an asbestos abatement activity affecting start dates, end dates, or quantities, etc., where the JSC APM must notify the TDSHS of a project amendment, are submitted in writing to the APM at least 2 working days in advance. The APM will process the request and submit the amendment to the TDSHS. The contractor shall not implement the changes until the JSC APM confirms that the required amendments were filed with the TDSHS. If the project start date was changed, then the contractor shall not begin these activities until ten (10) working days after the JSC APM confirms that the required amendment was filed with the TDSHS.

f. During major, large-scale abatement activities, upon request, contractors shall provide the JSC APM, or his or her designee, with:

1. Job progress reports detailing abatement activities, progress on previously established milestones and schedules; major problems and actions taken; injuries; equipment and

bulk material used; air-sampling results taken by the contractor or a representative; and any OSHA compliance monitoring results.

2. Copies of daily worksite entry logs with information on worker and visitor access.

Table 12.6-1

Notification Requirements

	Asbestos Class			
Notifications Made to:	I	II	III	IV*
Facility Manager and Work Area Supervisor	X	X	X	X
Occupational Health Services Contractor (SD33)	X	X	X	X
JSC Environmental Office (JE): shall provide written notice 15 working days before project start when exceeds limits or involves building demolition	X	X		
* Asbestos Class IV notifications only required for emergency response				

Table 12.6-2
Telephonic and Oral Notification Requirements
a. Name and Telephone Number of caller
b. Organization and Employer
c. Job Location: Building Number and Room Number
d. Asbestos JPR and description of activity
e. Start Day and Time
f. Estimated job completion time Day and Time
g. Name and Telephone Number of the Competent Person
h. Amount of ACM that will be removed in either linear feet, square feet, or cubic feet
i. Assurance the following items on the work permit are current or are available at the worksite: • Medical exams and respirator fit test • Training of workers • Respirators and PPE or clothing • Materials to establish the regulated area • Equipment to perform the JPR and perform cleanup or decontamination • Hazard warning signs

Chapter 12.7
Competent Person

1. Requirement

JSC requires that all asbestos-related work, which meets the definition of construction work in 29 CFR 1910.12 and 29 CFR 1926.1101(a), be conducted under the supervision of a competent person as defined below.

> *A **competent person** is one who is capable of identifying existing and predictable hazards in the work area or unsanitary, hazardous, or dangerous working conditions, and who has authority to take prompt corrective measures* (29 CFR 1926.32(f)).

The following requirements apply to a competent person:

a. 29 CFR 1926.1101(b) states that "…competent person means, in addition to the definition in 29 CFR 1926.32 (f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure…" and "… who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f)." The competent person shall ensure that all asbestos work follows the approved work practices and work plans.

b. The duties of the ***competent person*** to supervise asbestos-related work and to perform inspections and other activities are detailed in 29 CFR 1926.1101(o). According to JSC policy, if you are a ***competent person***, you shall be capable of performing the class of asbestos-related work over which you have control. Per Part 12, as a competent person**,** sign the "Job Procedure Requirements and Notification Form" (see Chapter 12.1). If the assigned competent person is not at the job site, he or she should visit the job site periodically during the course of the work.

2. Qualifications

The following qualifications are required for a competent person:

a. Class I and Class II competent person:

1. If you are designated a competent person for any Class I and Class II asbestos work, you shall demonstrate current training meeting the requirements of EPA's Model Accreditation Plan (40 CFR 763, Subpart E, Appendix C) for supervisor, or its equivalent. This 5-day training course includes specific lecture topics, demonstrations, at least 14 hours of hands-on training, individual respirator fit testing, a course review, and a written test. If you have a current license issued under 25 TAC 295.46 for an Asbestos Abatement Supervisor, then you have demonstrated that you have met this requirement.

2. This training expires exactly 12 months after the date of the initial or last refresher training; you may not perform as a Class I or Class II competent person until you have

again received the required 8-hour refresher training. If you let more than 24 months lapse since the date of your last training, you shall retake the 5-day initial training.

3. Shall have a minimum of 6 months experience either: (i) after initial completion of a 40-hour Contractor/Supervisor training; or (ii) as an OSHA Class I/II asbestos abatement worker.

4. Pass a written test developed and administered by OHD, to evaluate the ability of the candidate to identify and predict asbestos hazards in the work place and to demonstrate a working knowledge of OSHA, EPA, and JSC asbestos regulations, policies, and procedures.

b. Class III and Class IV competent person for asbestos work involving minor abatement or spill response.

1. If you are designated a competent person for Class III or Class IV asbestos work involving minor abatement or spill response abatement (e.g., single glove bag removal or spot abatement with waste limited to one asbestos waste bag), you shall demonstrate current training meeting the requirements of EPA's Model Accreditation Plan (40 CFR 763, Subpart E, Appendix C) for supervisor, or its equivalent. This 5-day training course includes specific lecture topics, demonstrations, at least 14 hours of hands-on training, individual respirator fit testing, a course review, and a written test. If you have a current license issued under 25 TAC 295.46 for an Asbestos Abatement Supervisor then you have demonstrated that you have met this requirement.

2. As a Competent Person for Class III and Class IV work, you shall also complete either the 8-hour "Class III Asbestos Operations and Maintenance (O&M) (Restricted)" course or a 2-hour training course on JSC policies and procedures. These courses are offered by OHD and are required to familiarize you with JSC policies, procedures, and job performance requirements described in Chapter 12.15 and Appendix 12B as well as the conditions to be found at JSC.

3. To maintain currency as a Competent Person for Class III and Class IV work, you shall take the 2-hour JSC "Class III Asbestos Operations and Maintenance (O&M) (Restricted) (Refresher)" course offered periodically by OHD and shall also maintain currency in training as a Class I/Class II Contractor/Supervisor.

4. Training expires exactly 12 months after the date of the initial or last refresher training. You may not perform as a Class III or Class IV competent person until you have again received the required refresher training. If you let more than 24 months lapse since the date of your last training, you shall retake the 5-day Contractor/Supervisor Course and the JSC 8-hour "Class III Asbestos Operations and Maintenance (O&M) (Restricted)" course.

5. Shall have a minimum of 6 months experience either: (i) after initial completion of a 40-hour Contractor/Supervisor Course; or (ii) as an OSHA Class I/II asbestos abatement worker.

6. Pass a written test developed and administered by OHD, to evaluate the ability of the candidate to identify and predict asbestos hazards in the work place and to demonstrate a working knowledge of OSHA, EPA, and JSC asbestos regulations, policies, and procedures.

c. Class III O&M (Restricted) competent person:

1. As a competent person for any Class III O&M (Restricted) asbestos work, you shall demonstrate current training meeting the requirements of 40 CFR 763.92(a)(2) for custodial and maintenance staff. This training consists of at least 16 hours in specific topics, demonstrations, and hands-on training in the use of respiratory protection, other personal protective measures, and good work practices. (See Chapter 5, paragraph 3.e. for more details on this training.)
2. As a competent person for Class III O&M (Restricted) asbestos work, you shall also complete the 8-hour "Class III Asbestos Operations and Maintenance (O&M) (Restricted)" course offered by OHD. This training is required to familiarize you with JSC policies and procedures as well as the conditions to be found at JSC.
3. As a competent person for Class III O&M (Restricted) asbestos work, you shall take the 2-hour JSC "Class III Asbestos Operations and Maintenance (O&M) (Restricted) (Refresher)" course offered periodically by OHD to remain current as a Class III O&M (Restricted) competent person.
4. The training described in this paragraph expires 12 months after the date of your initial or last refresher training. If you can demonstrate that you are scheduled for refresher training, you may continue to perform as a Class III O&M (Restricted) competent person on site at JSC until receiving the scheduled refresher training, but no longer than 14 months after the date of your prior training. If you let more than 24 months lapse since the date of your last training, you shall retake the 16-hour initial training and the JSC 6-hour "Class III Asbestos Operations and Maintenance (O&M) (Restricted)" course.
5. Shall have a minimum of 6 months experience as an OSHA Class III or Class III O&M (Restricted) asbestos worker.
6. Pass a written test developed and administered by OHD, to evaluate the ability of the candidate to identify and predict asbestos hazards in the work place and to demonstrate a working knowledge of OSHA, EPA, and JSC asbestos regulations, policies, and procedures.

d. You shall have sufficient authority to take prompt corrective measures to ensure compliance with OSHA, EPA, TDH, and TCEQ regulatory requirements and guidelines.

e. You shall be qualified to use respiratory protection (see requirements in Chapter 12.5).

Chapter 12.8
Asbestos Worker and Regulated Area Air Sampling

1. Air sampling objectives

Air sampling for airborne asbestos is done to meet a variety of needs. These include ensuring the protection of employees outside any asbestos-regulated work area, ensuring asbestos-regulated-area barriers maintain their integrity, documenting the exposures to asbestos workers, and meeting OSHA compliance requirements. These needs are met through a combination of the following types of air sampling: worker exposure, random area, work area, indoor ambient air, barrier, and clearance air sampling.

Perform air sampling and analysis at various stages of asbestos-related activities specified in Part 12 to establish and document that procedures limit the spread of airborne ACM. Collect and evaluate all samples taken to meet the requirements of this chapter following the procedures specified in the OSHA Reference Method, 29 CFR 1926.1101, Appendix A; NIOSH Method 7400, or NIOSH Method 7402. Conduct all sampling under the supervision of a CIH or an individual who has completed the air monitoring technician training requirements of 25 TAC 295.64(g) and who meets the requirements for licensing to perform air monitoring under 25 TAC 295.

2. Air sampling plans

Every ACM abatement or removal project requires an objective review of the air sampling requirements. Project planners shall determine the number and type of samples during the preparation of the work plan in consultation with the OHD (x36726). Each project may include the following air sampling requirements:

a. Pre-job air sampling (background ambient air)

b. During-the-job air sampling (worker or personal, work area, barrier integrity)

c. Post-job air sampling (clearance)

Air sampling shall be conducted for any Class I and Class II asbestos abatement activity using critical barriers, and may be conducted for other asbestos-related activities listed in Part 12. The OHD will establish and conduct random or periodic sampling of routine Class III and Class IV asbestos work activities. The OHD is responsible for determining the effectiveness of control procedures identified in Part 12 by periodically air sampling work activities.

3. Worker exposure air sampling

To determine worker exposure to asbestos, you shall:

a. Determine employee exposures from breathing zone air samples that are representative of the 8-hour TWA as well as the 30-minute TWA short-term excursion limit of each employee. Take breathing zone samples by attaching a sample collection device, generally a filter cassette, to the front collar of the worker's uniform.

b. If you are a contractor performing asbestos Class I and Class II work, you shall conduct worker exposure air sampling on your employees as required by 29 CFR 1926.1101. Provide copies of your sampling results to the OHD, who may also perform air sampling on contractor employees as a "spot check" of the contractor's procedures. The OHD will provide copies of its results to the asbestos work contractor.

c. The OHD has a database of worker exposure air sampling for most of the Class III and Class IV asbestos activities described in Chapter 12.15 and Appendix 12B. This database indicates that employees performing activities following the Class III and Class IV procedures in Part 12 shall have exposures less than the OSHA PEL of 0.1 f/cc of air. Any on-site or off-site contractors performing asbestos-related work may use the OHD database to meet the "initial exposure assessment" and "negative exposure assessment" requirements of either 29 CFR 1910.1001 or 29 CFR 1926.1101. The OHD periodically performs additional worker air sampling of Class III and Class IV activities to maintain and update its database, and will provide copies of results to the employer or supervisor of the monitored employee.

d. If you are an on-site contractor performing Class III or Class IV work at JSC, you're encouraged to perform your own personnel air sampling. If you do so, you shall provide copies of your sampling results to the OHD. If you're an off-site contractor performing Class III asbestos-related work at JSC, conduct worker exposure air sampling on your employees as required by 29 CFR 1926.1101, and provide copies of sampling results to the OHD.

e. Notify the employee(s) affected by air sampling results individually, as outlined in the current applicable OSHA regulation. Maintain a copy of each individual's air sampling results per OSHA Recordkeeping Requirements (29 CFR 1910.20, 29 CFR 1910.1001, 29 CFR 1926.1101).

4. Background and other ambient air sampling

The OHD will conduct:

a. Background ambient air sampling in buildings prior to any Class I or Class II asbestos abatement project where critical barriers and enclosures are to be erected. The OHD will conduct background ambient air sampling prior to any other project that may disturb spray-on asbestos insulation and has the potential to affect any building's ambient conditions; e.g., roofing projects.

b. Building ambient air sampling during any project that may disturb spray-on asbestos insulation and has the potential to affect any building's ambient conditions; e.g., roofing projects. This sampling is in addition to the routine building ambient sampling discussed

in Chapter 3, paragraph 6, of Part 12. Ambient air sampling results will be compared to the background samples and to the EPA "safe occupancy" level of 0.01 f/cc.

5. Regulated area barrier and containment integrity air sampling

The following applies to sampling for integrity of barriers and containment:

a. The OHD will conduct perimeter area surveillance during all Class I and Class II asbestos abatement projects as required by 29 CFR 1926.1101. The purpose of this surveillance is to ensure that no asbestos exposures occur in adjacent areas and that any critical barriers do not leak. Air sampling may or may not be performed on projects conducted outdoors or with outdoor barriers. (Reference 29 CFR 1926.1101(g)(4)(ii)(B)).

b. The OHD may conduct periodic perimeter area surveillance of routine Class III and Class IV asbestos work to ensure that established procedures control asbestos releases.

c. All barrier air sampling results will be compared to the EPA "safe occupancy" level of 0.01 f/cc. (Reference 40 CFR 763.90(i)(5) and 29 CFR 1926.1101(g)).

6. Work area air sampling

The OHD may perform air sampling inside regulated areas where critical barriers are not used, or may perform air sampling adjacent to glovebag abatement or removal activities. The purpose of this sampling is to "spot check" procedures and to ensure asbestos is being controlled.

7. Clearance air sampling

To clear an asbestos job for completion:

a. The JSC Occupational Health Officer, or his or her designee(s), and the OHD are the only parties at JSC who may declare an area safe for re-occupancy when clearance air sampling is conducted on asbestos abatement, repair, or emergency response activities. The decision will be based on the results of visual inspection and clearance air sampling.

b. The OHD will perform clearance air sampling on all Class I and Class II asbestos abatement activities to ensure that the area is safe for re-occupancy. If enclosures or critical barriers are erected, the OHD may use aggressive sampling techniques to collect clearance air sampling air samples before the enclosures or critical barriers are disassembled. The enclosures or critical barriers shall never be disassembled until the JSC Occupational Health Officer or the OHD determines that the area is safe for re-occupancy and gives approval to disassemble the enclosures or critical barriers.

c. The OHD may perform clearance sampling on Class III asbestos activities. The decision to perform this sampling is dependent upon the specific task and the professional judgment of the industrial hygienist regarding the potential health hazard to other building occupants. This sampling may also be performed to "spot check" procedures and to

ensure asbestos is being controlled. If clearance air sampling is conducted, the regulated area shall not be disassembled, neither shall the demarcation be removed, until the JSC Occupational Health Officer or the OHD determines that the area is safe for re-occupancy.

d. The OHD may perform clearance air sampling on emergency response asbestos cleanup activities. The decision to perform this sampling will depend on the amount of asbestos material spilled, whether a room or area was closed off, and the professional judgment of the industrial hygienist regarding the potential health hazard to other building occupants. If clearance air sampling is conducted for emergency response activities, the regulated area shall not be disassembled, neither shall the demarcation be removed, until the JSC Occupational Health Officer or the OHD determines that the area is safe for re-occupancy.

d. All clearance air sampling results will be compared against the EPA "safe occupancy" level of 0.01 f/cc. (Reference 40 CFR 763.90(i)(5) and 29 CFR 1926.1101(g)).

Chapter 12.9
Regulated Areas, Site Preparation, and Negative Pressure Enclosures

1. What this chapter covers

This chapter outlines the asbestos work requirements for regulated areas, site preparation, and negative pressure enclosures. Organizations and contractors performing these tasks for asbestos work shall follow industry accepted practices and procedures, and comply with applicable OSHA and EPA regulations.

2. Regulated areas

You shall conduct all Class I, Class II, Class III, and Class IV emergency response asbestos-related work at JSC within a regulated area. The methods and systems for establishing a regulated area are described in paragraph 3 below.

The OSHA definition (29 CFR 1926.1101) of a regulated area is:

> ***An area established to demarcate areas where asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the permissible exposure limit.***

You shall follow these requirements:

a. *Demarcation*. Mark the regulated area in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne asbestos. Where critical barriers or negative pressure enclosures are used, demarcate the regulated area with the barriers or enclosures. Provide signs and display as required by Chapter 12.10 of this handbook.

b. *Access*. Limit access to regulated areas to people who are authorized and trained to perform asbestos work and who are wearing protective clothing, respiratory protection, and other PPE. Establish a list of authorized personnel before starting a job and post that list in the unrestricted clean area of the job site. The job site superintendent or on-site competent person has control of site access.

c. *Respirators*. Supply all persons entering a regulated area where employees are required to wear respirators with a respirator that meets OSHA standards 29 CFR 1926.1101(h) and 29 CFR 1910.134.

d. *Prohibited activities*. People inside a regulated area shall never eat, drink, smoke, chew tobacco or gum, or apply cosmetics.

3. Methods and systems used to establish a regulated area

You shall follow these requirements to establish a regulated area:

a. Every regulated area used for asbestos-related activities specified in Part 12 shall use at least one of the methods or systems described below to prevent visible emissions from the worksite and to prevent the escape of airborne asbestos fibers into the general environment. Any method used shall meet the engineering control requirements of 29 CFR 1926.1101(g). Submit a work plan for any task requiring a large-scale enclosure to the APM per the notification requirements of Part 12.

b. The methods and systems for Part 12 and the job performance requirements are classified into the following four systems:

   1. Barrier with floor covering
   2. Glovebag
   3. Small enclosure, mini-enclosure, or "pop-up" enclosure (e.g., "Klean Kube®")
   4. Large enclosure

c. You may use barriers with no enclosure if there is little risk of spreading asbestos into the general area or if there is minimal risk to individuals who may pass into the work area unknowingly. Barriers are used when the primary concern is to keep building occupants or other employees from inadvertently getting into the work area where there might be a localized risk of asbestos exposure. The regulated area shall be visibly identified using any marker (i.e., signs and tapes or barricades) that warns employees or visitors to stay out of the work area. These barrier systems are used with polyethylene floor coverings to prevent localized contamination.

d. Use glovebags when the work is small enough to be completed in the bag. These are usually restricted for use on pipes, joints, and valves, but may be used for spot abatement of small amounts of spray-applied asbestos insulation. *NEVER PERFORM GLOVEBAG REMOVAL ON HOT PIPES!* This may cause the bag or gloves to melt over the workers' hands and arms. Devise special procedures if glovebags are used on hot pipes.

e. Use small enclosures when the work area is larger than can be accommodated by a glovebag or is needed to provide more protection than a barrier system. The small enclosure is generally limited in size and used for small-scale, short-duration activities. A small enclosure may not involve the use of negative pressure systems, but will have an entrance chamber or multiple entry flaps. Small enclosures rely on HEPA-filtered vacuums and wet methods to control fiber concentrations. You may use small enclosures for any repair or maintenance activity that may disturb ACM and release airborne asbestos fibers.

f. Use large enclosures for asbestos-related projects that a small enclosure cannot accommodate. Large enclosures will usually include the use of a negative-pressure air filtration system to isolate the work area from the general building area that is not involved in the asbestos-related activity. The large enclosure may involve the use of ancillary contamination controls (e.g., showers, change or clean rooms, waste load out

chambers, decontamination rooms, contaminated equipment rooms, etc.). Large enclosures for Class I and Class II asbestos work shall pass inspection by the OHD before the asbestos-related activities start.

g. The OSHA regulations in 29 CFR 1926.1101 use the term "critical barrier." A critical barrier consists of "one or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area." Critical barriers are most often used on doorways, windows, and ventilation system openings. They are required for Class I and II asbestos work, but may also be used on Class III work.

h. Table 12.9-1 below indicates the regulated area methods and systems that are appropriate for each class of asbestos work. Please note that containment for an emergency response could involve any of the four methods and depends upon the judgment of the responders. Essentially, an emergency response to a major fiber release episode could involve procedures meeting the requirement of Class I or Class II asbestos abatement or removal.

Table 12.9-1. Regulated Area Methods or Systems Used with Asbestos Work Classes

Methods or Systems	Asbestos Class			
	I	II	III	IV*
Barrier and floor covering			X	X
Glovebag			X	X
Small enclosure	X	X	**x**	X
Large enclosure	X	X	X	X
Critical barriers	X	X		X

*Only required for asbestos Class IV emergency response.

4. Site preparation

Before any asbestos-related activity, prepare the worksite for follow-on actions. You shall take the following steps to define the regulated area and limit contamination of furniture and equipment.

a. *Post warning signs and barriers*. Place warning signs and temporary barriers, if an enclosure is not required, at all entrances and approaches to the regulated area. Warning signs shall meet the requirements specified in Chapter 12.10.

b. *Cleaning and removal of furnishings and equipment*. Remove all non-stationary items that can feasibly be taken from the work area to prevent damage or contamination of the items.

1. Before storing these items outside the work area, clean them of visible debris with a HEPA-filtered vacuum or wet wipe to remove any asbestos-containing dust.
2. Thoroughly pre-clean the designated work area before beginning containment construction. If carpets in the work area remain, vacuum them with a HEPA-filtered vacuum and cover them with 6-mil polyethylene sheeting. You may use plywood between the layers of polyethylene to help protect the carpets from damage and maintain the containment integrity.

c. *Follow these requirements for sealing stationary items*:

1. If it is not feasible to remove items from the work area, completely cover them with a minimum of one layer of 6-mil polyethylene. For Class I and Class II activities, seal these covers and secure them with duct tape.
2. If stationary equipment such as electrical transformers, refrigeration equipment, or other electrical heat-generating equipment shall continue to operate during the asbestos-related activity, make special provisions to prevent creating a fire hazard. Such items shall have constant ambient airflow or they may overheat. In these situations, provide a separate framework to support the polyethylene sheeting, with provision for separate air intake and exhaust outside the defined work area.

4. Negative Pressure Enclosures

You shall follow these requirements for any negative pressure enclosure (NPE) used with OSHA Class I and Class II asbestos abatements projects:

a. The machine(s) used to maintain a NPE must provide at least 4 air changes per hour and maintain a pressure differential of at least -0.02 column inches of water inside the NPE relative to outside pressure. (Ref OSHA 29 CFR 1926.1101(g)(5)(i)(A))

b. The NPE must be kept under negative pressure throughout its period of use. (Ref OSHA 29 CFR 1926.1101(g)(5)(i)(A))

c. Pressure measurements shall be recorded for the NPE throughout its entire period of use. The recording of the pressures may be done by either using a strip-chart recorder on the manometer or by an employee writing down the pressure readings on a log sheet at hourly intervals.

d. An employer maintaining a NPE must have an employee immediately available for the entire period of use to take action to restore negative pressure in case the machine maintaining the NPE fails.

e. The machine maintaining the NPE shall run continuously until passing a clearance inspection and, as applicable, passing clearance air sampling.

Chapter 12.13
Waste Disposal

1. Introduction

This chapter addresses the handling, packaging, labeling, and disposal of all ACM and asbestos-contaminated waste generated on site. Disposal of the ACM or asbestos-contaminated waste generated by JSC activities shall follow the Texas Administrative Code, Title 30 Environmental Quality, Part 1 Texas Commission on Environmental Quality (TCEQ), Chapter 330 Municipal Solid Waste, Subchapter F Operational Standards for Solid Waste Land Disposal Sites, Rule 330.136 Disposal of Special Wastes (30 TAC 330.136).

2. Types of waste

In addition to the actual ACM removed during an asbestos-related job or abatement, you shall also dispose of a number of other materials and items as asbestos-contaminated waste. These include, but are not limited to, the following:

a. Cloths and mops used during wet-cleaning operations.

b. Disposable coveralls, hoods, booties, and other clothing items worn in the work area, unless they can be completely decontaminated using a HEPA-filtered vacuum. Work shoes and boots may be cleaned at the end of the project, but shall be removed and stored in labeled plastic bags between projects.

c. Contaminated respirator filters and towels used by workers after showering.

d. Ceiling tiles taken from suspended ceilings where friable asbestos was applied above the tile, unless properly decontaminated.

e. All plastic sheeting used for critical barriers, air locks, decontamination chambers, and area containments.

f. Excess wastewater generated from wet-wiping or -mopping along with shower wastewater from the decontamination chamber. JSC permits wastewater to be discarded into a sanitary drain if it has first been filtered to a no-greater-than 5-micron particle.

g. All air and water filters used in control devices.

3. Waste handling procedures

You shall follow these requirements for handling asbestos waste:

a. Package all asbestos waste for disposal using one of the following sealed, leak-tight methods:

   1. Double-bagged in at least 6-mil polyethylene bags
   2. Sealed in plastic-lined cardboard or metal or fiber drums, boxes, or containers meeting U.S. Department of Transportation (USDoT), TCEQ, and TDSHS specifications
   3. Double-wrapped in at least 6-mil polyethylene sheeting (e.g., for the removal of ACM-contaminated components or piping)

b. Wet asbestos waste, scrap, debris, bags, containers of asbestos-contaminated equipment, clothing, vacuum cleaner bags, filters, etc., consigned for disposal with amended water until the waste, etc., is sufficiently wet and to prevent emission of airborne fibers if the container were to break open.

c. When waste is double-bagged in 6-mil plastic bags, use a HEPA-filtered vacuum to remove excess air from the bags.

d. Do not fill bags so that the neck of the bag cannot be tightly gathered, folded over, and securely taped or so that the weight of the bag is too heavy for one person to carry.

e. Cut ACM-containing sharp edges to size, including wire-lath ceilings, and adequately wet and package in a manner to prevent penetration or puncture of the container seal.

f. Filter all asbestos-contaminated water collected from wetting, cleaning, or decontamination to a no-greater-than 5-micron particle size before disposal in the sanitary sewer.

g. If a separate waste-removal airlock system is installed in an enclosure, construct it like a decontamination chamber, using double 6-mil polyethylene plastic floors and walls and triple door flaps. Keep the entrance to this airlock tightly sealed until the airlock is to be used for the transfer of waste material. Attach a JSC Form 1161, "Disposal Inventory for Miscellaneous Hazardous Waste," to each package, bag, or container of asbestos waste materials.

4. Labeling waste containers

You shall follow these requirements for asbestos waste containers:

a. Label waste packages, bags, and containers with the following:

DANGER

CONTAINS ASBESTOS FIBERS

AVOID CREATING DUST

CANCER AND LUNG DISEASE HAZARD

b. Bags may be preprinted or separate labels affixed to the bags. In all instances, label bags before filling them with waste materials. Assume anything placed into an ACM-labeled bag is ACM or asbestos-contaminated waste and dispose of accordingly.

c. The generator of the asbestos waste shall additionally mark all waste containers with the generator's name, organization, and removal location and shall attach the JSC Form 1161.

5. Disposing of asbestos waste

To properly dispose of asbestos waste, you shall:

a. Properly package and label waste asbestos materials generated by JSC organizations and support contractors and dispose of them by calling the Work Control Center, x32038.

Make note of the Work Control Pickup Ticket number assigned by the Work Control Center on the Asbestos Work Permit.

b. For Construction of Facilities and other large asbestos abatement projects, make special arrangements through the JSC Environmental Office (JE) or the JE environmental support contractor (x36207) for lined, roll-off containers in which to accumulate the packaged asbestos waste.

Chapter 12.14
Emergency And Mishap Procedures

1. What this chapter covers

This chapter discusses planning for, reporting, and investigating emergencies, injuries, and mishaps that may happen during asbestos-related activities, and also discusses emergency response to asbestos fiber releases.

2. Requirement for emergency planning

To properly plan for asbestos emergencies, you shall follow these requirements:

a. Plan and conduct all asbestos-related activities so as to:

   1. Take all reasonable and proper actions to prevent or limit exposures and injury to personnel and damage to, or loss of, equipment and property.

   2. Report such occurrences to appropriate JSC offices in a timely manner and in compliance with Part 12.

   3. Conduct investigations of all mishaps to determine the actual or probable cause(s), take appropriate actions to avoid reoccurrence, and document and disseminate relevant information.

b. Generally, incidents involving fire or personal safety use the procedures established by JSC's Emergency Preparedness Program and this handbook.

c. Incidents involving an unexpected release or threatened release of asbestos that do not involve personal injury, fire emergencies, or personal safety will be considered an environmental release.

3. Non-enclosed work area

The existing procedures for reporting medical and fire emergencies and guidelines for general emergency action and planning (Chapter 3.8 of this handbook) apply to the asbestos-related activities specified in Part 12 that do not require the use of an enclosure.

4. Enclosed work area

a. The reporting procedures and general guidelines specified above are also applicable to the asbestos-related activities specified in Part 12 that require an enclosure to control airborne asbestos fibers.

b. In the case of large-scale abatement tasks, emergency procedures shall be in written form and provided with the work plan. Post-emergency procedures shall be displayed prominently in the clean change area of the enclosure, with telephone numbers of emergency response personnel.

c. All employees required to be in the work area shall read and sign these procedures before first entry to acknowledge understanding of the worksite layout, location of emergency exits, and emergency procedures.

d. If the integrity of the enclosure is breached at any time during the project, the work crew shall immediately implement fiber control using a wetting agent, repair the breach with polyethylene sheeting or tape, and call OHD (x36726), APM (x33120), and the Work Control Center (x32038).

5. Personal injury procedure

If an employee is injured while working on an asbestos job, you shall follow these requirements:

a. For non-life-threatening situations, employees injured or otherwise incapacitated shall be decontaminated following normal procedures with assistance from fellow workers, if necessary, before exiting the workplace to obtain medical treatment.

b. For life-threatening injury or illness, worker decontamination takes a low priority. Measures necessary to stabilize the injured worker, removal from the workplace, and medical treatment take top priority. Inform emergency response personnel, who are providing medical treatment, or transportation of the existence of asbestos contamination on the injured or ill worker.

c. If the injured or ill worker is to be moved off JSC while wearing contaminated work clothing, a knowledgeable person from the worksite shall accompany the worker to provide information to the receiving medical unit, and to assist in controlling the further spread of asbestos contamination outside the enclosed area.

6. Emergency reporting

Report a fire, medical, or other emergency associated with an asbestos-related activity specified in Part 12 by calling the JSC EOC at x33333 (281-483-3333) for JSC, Sonny Carter Training Facility and at Ellington Field.

7. Mishap notification, investigation, reporting, and recordkeeping

The notification, investigation, reporting, and recordkeeping of mishaps that occur during asbestos-related activities specified in Part 12 shall follow Chapter 2.7 of this handbook as well as the recordkeeping requirements of all applicable OSHA regulations and standards.

8. Emergency response to fiber release for environmental cleanup

When ACM fiber releases (spills) are located, you shall immediately evacuate personnel and seal off the area. Also contact OHD at x36726 andthe JSC Emergency Dispatch Center

(EDC) at x33333 (or 281-483-3333) to request the JSC Spill Team response. The following requirements govern the response:

a. FSS Environmental Support and OHD personnel will determine control measures to be established. OHD will determine the need to perform clearance air sampling.

b. FSS contractor personnel, when responding to a fiber release, shall not proceed with the cleanup until they ensure that OHD has been notified.

c. Activities for performing site cleanup and decontamination shall be as outlined in JPR IV-4 (see Appendix 12B, Attachment 12G). The competent person for the cleanup shall determine whether the cleanup will be conducted under OSHA Class I, II, III, or IV asbestos work procedures.

d. If spills are small and FSS contractor personnel establish the regulated area, the FSS personnel shall disestablish the area after final cleanup and inspection, and will be responsible for removing barrier tape and warning signs. If OHD establishes the regulated area or decides that clearance air sampling is required, it will disestablish the area after final cleanup and inspection, and will be responsible for removing barrier tape and warning signs.

e. Since communication with all affected parties in the affected area is very important, the organization responsible for establishing the regulated area shall ensure that the facility manager and work area supervisor have been informed about the response activity, the cleanup process and clearance air sampling to be performed (if required), and the approximate duration of the cleanup. This notification may be verbal but shall occur before the start of the cleanup. Ask the facility manager and work area supervisor to inform the occupants of the affected area. Additionally, inform occupants and employees in nearby areas about the cleanup activity and the expected duration.

f. The organization responsible for establishing the regulated area and for removing the barrier tape and warning signs shall provide courtesy notification to the EOC security dispatcher at the nonemergency extension (x34658) at the start and completion of the cleanup. Additional notification to JSC management will be made at the discretion of the responders.

The organization responsible for removing the barrier tape and warning signs shall also notify the facility manager and work area supervisor when the area is clean and operations may return to normal. These notifications shall be made in writing within 2 hours of the cleanup completion; e-mail notification is acceptable.

Chapter 12.15
Job-Specific Performance Requirements - General Information

1. General job-specific performance requirements

You shall follow these requirements for asbestos jobs:

a. Attachments 12A-12G, in Appendix 12B, contain individual Job-Specific Performance Requirements (JPRs) for the most common jobs at JSC that potentially involve ACM. Table 12.15-1 below lists the activities by Class of asbestos work as defined in Chapter 12.4 of this Handbook. All JPR numbers reflect the Class of asbestos work being performed. Table 12.15-1 also lists the attachment from Appendix 12B that describes the performance requirements. Each description in the appendices provides sufficient information to determine which jobs fit within the procedure. The JPR requirement descriptions in this chapter and in Appendix 12B are the pre-approved project designs for asbestos Class I and Class II abatement activities involving less than 260 linear feet, 160 square feet, or 35 cubic feet of ACM and for asbestos Class III activities.

b. Following the job description in each attachment is a listing of minimum requirements for completing the described asbestos work. These listings may not be complete and trained asbestos workers are expected to perform all Classes of asbestos-related work using industry accepted work practices and controls. Work supervisors and competent persons shall exercise discretion on some requirements; e.g., determining the size of containment system or enclosure for Class I asbestos work.

c. Table 12.15-1 also lists the ***minimum*** training requirements needed to perform each JPR. The training abbreviations shown in the table, and their meanings from Chapter 12.5, paragraph 3, are:

   1. 32-hour worker: training specified in 40 CFR 763, Subpart E, Appendix C, for all Class I work and Class II work, to include the use of critical barriers and negative pressure enclosures.

   2. 16-hr O&M: training specified in 29 CFR 1926.1101(k)(9)(v) and 40 CFR 763(a)(2) for Class III operations and maintenance work, involving Class III glovebag or spot abatement activities.

   3. JSC 8-hr: training for Restricted Class III Asbestos Operations and Maintenance Work as shown in Chapter 12.5, paragraph 3. This training does not allow workers to perform removal of any amount of ACM.

   4. 2-hr: Class IV awareness training required by 29 CFR 1926.1101(k)(9)(vi) and 40 CFR 763(a)(2) for housekeeping and custodial activities.

   5. RFCI: Training in the methods specified by the Resilient Floor Covering Institute (RFCI) for the removal of resilient floor coverings and adhesives which contain asbestos. The specific methods used may be found in the RFCI document "*Recommended Work Practices for Removal of Resilient Floor Coverings*" at

http://www.rfci.com/index.php . See the TDSHS statement concerning RFCI procedures at http://www.dshs.state.tx.us/asbestos/pdf/ARC022.pdf.

d. If you do not find the asbestos-related work in one of the listed procedures in Table 12.15-1 or Attachments 12A-12G, in Appendix 12B, define the job by the Class of asbestos work as found in Chapter 12.4 of this Handbook or in 29 CFR 1926.1101, then develop an alternative procedure as required by Chapter 12.2 of this Handbook and submit an asbestos project design as required by Chapter 12.6..

e. If your activity will cause the demolition of a building or portion thereof, regardless of whether ACM has been identified or not; or if you perform asbestos Class I or Class II abatement work using an Alternative Procedure under Chapter 12.2, Paragraph 5; or if you perform asbestos Class I or Class II abatement work involving the removal of ACM or PACM in quantities equal to or greater than 260 linear feet, 160 square feet, or 35 cubic feet of ACM, you shall submit an asbestos project design as required by Chapter 12.6.

f. Plan all asbestos-related work following the procedures in Chapter 12.1 and 12.2 of Part 12 of this Handbook.

2. Exposure control program

The underlying assumptions behind the development of the exposure controls reflected in the JPRs are:

a. All tasks involving potential asbestos exposure require some degree of control. Hence, the removal of even one ceiling tile in a building known to contain asbestos SAI is covered by Part 12. The degree of control is tailored to the potential of exposure to workers and to building occupants.

b. When it is necessary to open an area of suspended ceiling in a building containing SAI, such that a total of 32 square feet or more (i.e., the 4th contiguous ceiling tile) is exposed, you shall erect a small enclosure.

c. Spot removals of any amount of SAI require the erection of an enclosure, but may not require specific decontamination areas (e.g., shower area, clean room, equipment rooms). Place the enclosure under local negative pressure using a HEPA-filtered vacuum cleaner or negative-pressure systems as described within Part 12. "Pop-Up" style mini-enclosures (Klean Kubes® or equivalent units) are commercially available for this purpose. You shall use additional safeguards such as wetting and catching the material close to the scrape.

d. Any job that requires the removal of 3 contiguous square feet or greater of asbestos from a surface (other than a pipe surface if glovebag procedures are used), or which has a sufficient number of small-scale spot removals such that the cumulative amount of insulation removed exceeds 35 cubic feet, 160 square feet, or 260 linear feet of pipe is, under this program, a major asbestos removal operation. Major removals require the submission of a project design to the APM, which details how the enclosure,

decontamination, monitoring, record keeping, and clearance requirements are to be satisfied.

e. The above assumptions represent JSC's best effort in interpreting the OSHA and EPA guidelines, which are based on specific fiber concentrations, and establishing a workable program for controlling asbestos exposure. The OHD will monitor various jobs to determine whether the degree of control described above provides adequate environmental and health protection. Therefore, the performance requirements may be revised. For example, it may be necessary to reduce the small enclosure criteria to below 32 square feet, if controls are inadequate.

3. Waivers to job performance requirements

Except for JPR III-13 (see Attachment 12F), no waivers to the JPR procedures in Appendix 12B, Attachments 12A-12G will be issued. The following requirements apply.

a. In buildings with SAI, raised computer floors and sub-floors may contain SAI debris from activities performed in the building before asbestos work was regulated at JSC. The entry into any computer floor or sub-floor, in a building containing SAI, is normally considered Class III asbestos work governed by JPR III-13. The JSC Occupational Health Officer, or his designee, may issue a waiver releasing workers from these Class III requirements under the following conditions:

1. The area can be easily delineated above and below the raised flooring into “clean” and “dirty” sections. Normally, the delineation shall be done by rooms defined by hard walls above the floor. The Occupational Health Officer, or his designee, may establish other delineation in special cases.

2. Clean the area below the raised floor (as well as any equipment or cabling below the floor), the flooring support structure, and the flooring tiles using wet wiping and mopping methods and HEPA vacuuming. Clean any items removed from the sub-floor area by wet wiping or HEPA vacuuming as they are removed from the floor. Clean following the procedures shown in JPR III-13. Workers performing these activities shall wear protective clothing and respiratory protection.

3. The JSC Occupational Health Officer, or his designee, will visually inspect the sub-floor area after cleaning. The basic standard of cleanliness for the sub-floor area is no visible dust or debris.

4. When the JSC Occupational Health Officer, or his designee, is satisfied about the cleanliness of the sub-floor area, he or she will issue a JPR III-13 Waiver for the specific area cleaned. The OHD will post the waivers on the JSC Health Home page at http://sd.jsc.nasa.gov/omoh/scripts/OccupationalHealth/JPRWaivers.aspx. The waivers, once issued, do not expire.

5. Personnel entering an area with a JPR III-13 Waiver are encouraged to use a HEPA vacuum for periodic housekeeping under the sub-floor.

b. Even though a waiver to JPR III-13 procedures may be issued, there may be other installed suspect ACM beneath the sub-floor. These materials may include, but are not limited to, cementitious pipe chase materials, transite board, sub-floor stanchion mastic, firewalls, floor tiles and mastic, etc. If any sub-floor activities are planned, which may disturb these materials, you shall determine the asbestos content, or presumed asbestos content, and follow other appropriate JPR requirements.

Table 12.15-1

Job Performance Requirements Listing

Asbestos Work Class	Task Title	JPR No.	Reference App. 12B Atch No.	Min. Req'd Training
Class I				
	Removal of Surfacing Insulation (≥ 10 sq ft cumulative and < 160 sq ft cumulative). Decontamination area (equipment room, shower area, clean room) required.	I-1	12A	32 hr worker
	Removal of Thermal System Insulation (piping: ≥ 25 Lf cumulative and < 260 Lf) (vessel: ≥ 10 sq ft cumulative and < 160 sq ft or < 35 cu ft) or glove bag not feasible. Decontamination area (equipment room, shower area, clean room) required.	I-2	12A	32 hr worker
	Removal of Surfacing Insulation (≥ 3 sq ft contiguous (or one waste bag) and < 10 sq ft cumulative). Decontamination area not required but may be used.	I-3	12A	32 hr worker
	Removal of Thermal System Insulation using glove bags (piping: ≥ 3 Lf continuous, more than one spot abatement, more than one waste bag and < 25 Lf cumulative) (vessel: ≥ 3 sq ft contiguous, more than one spot abatement, more than one waste bag and < 10 sq ft cumulative) . Decontamination area not required but may be used.	I-4	12A	32 hr worker
Class II				
	Removal of or modification to wallboard, plaster, transite, ceiling tiles, flooring, roofing, or siding containing asbestos. Airborne concentrations likely to ≥ 0.01 f/cc or a negative exposure assessment not available. Equipment room required for large enclosures.	II-1	12B	32-hr worker
	Removal of or modification to wallboard, plaster, transite, ceiling tiles, flooring, roofing, or siding containing asbestos. Airborne concentrations likely to <0.01 f/cc or a negative exposure assessment is available.	II-2	12B	32-hr worker
	Removal of less than (<) 160 sq ft of resilient sheet flooring using procedures and methods specified by the Resilient Floor Covering Institute (RFCI) to include: (i) ACM sheeting or (ii) sheeting with ACM backing or mastic; and where the waste exceeds the capacity of one standard waste bag.	II-3	12B	32-hr worker plus RFCI

Table 12.15-1 (continued)

Asbestos Work Class	Task Title	JPR No.	Reference App. 12B Atch No.	Min. Req'd Training
Class II (cont'd)	Removal of less than (<) 160 sq ft of flooring using procedures and methods specified by the Resilient Floor Covering Institute (RFCI) to include: (i) any ACM vinyl or asphalt tile or (ii) any vinyl or carpet tile with ACM mastic; and where the waste will exceed the capacity of one standard waste bag.	II-4	12B	32-hr worker plus RFCI
Class III				
Class III Glovebag	Repair of steam, chilled water, hot waterlines, and valves with TSI when less than (<) 3 linear feet of ACM or PACM is disturbed. Waste limited to one standard waste bag or one glovebag.	III-1	12C	16-hr O&M
Class III Barrier & Floor Covering	Activities which meet one or more of the following: a. Any entry into a ceiling plenum below surfacing or spray applied insulation/fireproofing (SAI) ACM or PACM where the ceiling opening is less than (<) 32 square feet; b. Any activity that disturbs (e.g., moves) ACM or PACM ceiling tiles below a plenum that does not contain surfacing or SAI ACM or PACM where the ceiling opening is < 32 square feet.	III-2	12D	JSC 8-hr O&M Restrict.
	Removal of ACM or PACM, where the waste generated does not exceed the capacity of a standard asbestos waste bag, and which involve the: a. Spot removal of ACM or PACM wallboard, joint tape, or joint compound b. Removal, replacement and disposal of ACM or PACM ceiling tiles below a plenum which does not contain surfacing or SAI ACM or PACM and where the ceiling opening is < 32 square feet.	III-3	12D	16-hr O&M
Class III Enclosure	Spot removal of surfacing ACM and PACM less than (<) 3 sq ft contiguous at a single spot. Limit one standard waste bag.	III-4	12E	16-hr O&M

Table 12.15-1 (Continued)

Asbestos Work Class	Task Title	JPR No.	Reference App. 12B Atch No.	Min. Req'd Training
Class III Enclosure (Cont'd)	Activities which meet one or more of the following: a. Any activity in close proximity (i.e., within 24 inches) of surfacing ACM or PACM; b. Any entry into a ceiling plenum below surfacing or spray applied insulation/fireproofing (SAI) ACM or PACM where the ceiling opening is greater than or equal to (≥) 32 square feet; c. Any activity that disturbs (e.g., moves) ACM or PACM ceiling tiles below a plenum that does not contain surfacing or SAI ACM or PACM where the ceiling opening is ≥ 32 square feet.	III-5	12E	JSC 8-hr O&M Restrict.
	Removal of non-ACM ceilings (plaster or sheetrock) below ceiling plenum in buildings with spray-applied asbestos insulation or fireproofing (SAI)	III-6	12E	16-hr O&M
Class III Other	Repair or maintenance of equipment that has ACM insulation or ACM gaskets	III-7	12F	16-hr O&M
	Repair or maintenance of equipment used in asbestos work. Does not apply to changing filters on HEPA vacuum(s) with a self-sealing or self-contained filter pack.	III-8	12F	16-hr O&M
	Removal of (i) ACM vinyl or asphalt floor tile (ii) non-ACM floor tile with ACM mastic; or (iii) carpet tiles with ACM mastic, using procedures and methods specified by the Resilient Floor Covering Institute (RFCI). Waste limited to one standard waste bag.	III-9	12F	16-hr O&M plus RFCI
	Any activity below raised computer floor and sub-floor in buildings with spray applied fireproofing or ACM acoustical ceilings	III-13	12F	JSC 8-hr O&M Restrict.
Class IV				
	Changing air filters in HVAC system air handling units	IV-1	12G	2-hr
	Emergency response action to incidental fiber release	IV-4	12G	32-hr worker
Custodial				
	Custodial work in areas with exposed, friable ACM	C-1	12H	Awareness
	Custodial work involving ACM flooring	C-2	12H	Awareness

Appendix 12B

Asbestos
Job Performance Requirements
and
Asbestos Glossary

This appendix contains the following attachments:

12A	Class I Asbestos Work
12B	Class II Asbestos Work
12C	Class III Asbestos Work – Glovebag
12D	Class III Asbestos Work – Regulated Area Defined by a Barricade with Floor Covering
12E	Class III Asbestos Work – Regulated Area Defined by an Enclosure
12F	Class III Asbestos Work – Other
12G	Class IV Asbestos Work
12H	Custodial Work
12J	Asbestos Glossary

Attachment 12A

Class I Asbestos Work

Class I Asbestos Work: Activities involving the removal of structural or ceiling Spray Applied Insulation (SAI), ceiling or acoustical decorative material, other surfacing material, or Thermal System Insulation (TSI) (i.e., piping and vessel insulation) that is considered Asbestos Containing Material (ACM) or is Presumed Asbestos Containing Material (PACM).

If you perform asbestos Class I abatement work involving the removal of equal to or more than 260 linear feet, 160 square feet, or 35 cubic feet of ACM or PACM, you shall (as required by Chapter 12.6):

(i) Submit an asbestos project design
(ii) Provide the JSC Environmental Office, at least 15 working days prior to beginning work, all information required to make notification to the TDSHS.

The JPR requirement descriptions listed in this attachment are the pre-approved project designs for asbestos Class I abatement activities involving less than 260 linear feet, 160 square feet, or 35 cubic feet of ACM or PACM.

A decontamination area is required for Class I removal involving over 25 linear feet or 10 square feet of TSI or surfacing ACM and PACM (Reference: 29 CFR 1926.1101 (j)(1)). The decontamination area shall consist of an equipment room, shower area, and clean room in series. The asbestos workers shall enter and exit the regulated area through the decontamination area

JPR I-1**: Removal of SAI, acoustical or decorative materials, or other surfacing material with a cumulative total of greater than or equal to (≥) 10 square feet but less than (<) 160 square feet of materials that have been identified ACM or PACM. A decontamination area is required.** JPR I-2: **Removal of Thermal System Insulation (TSI) with a cumulative total of greater than or equal to (≥) 25 linear feet and less than (<) 260 linear feet of materials that have been identified ACM or PACM. For vessels, a cumulative total of greater than or equal to (≥) 10 square feet but less than (<) 160 square feet or less than (<) 35 cubic feet of materials that have been identified ACM or PACM. Or, because of the size or geometry of the equipment involved, a glove bag is not a technically feasible method for removal. A decontamination area is required.**

JPR I-3: Removal of Surfacing (Spray Applied Insulation (SAI) or acoustical) or other surfacing material of greater than or equal to (≥) 3 square feet of contiguous area and a cumulative total of spot removals less than (<) to 10 square feet cumulative of materials that have been identified ACM or PACM. A decontamination area is not required but may be used.

JPR I-4: Removal of Thermal System Insulation (TSI) of greater than or equal to (≥) 3 linear feet of contiguous area (one waste bag), and less than (<) 25 linear feet of materials that have been identified ACM or PACM. For vessels, greater than or equal to (≥) 3 square feet of contiguous area, more than one spot abatement, more than one waste bag, and less than (<) 10

Class I Asbestos Work (cont.)

square feet cumulative of materials that have been identified ACM or PACM. Never slide glovebags along piping. A decontamination area is not required but may be used.

To accomplish these Class I asbestos work activities, a number of sequential and concurrent steps are required. The most prominent of these are listed below. You will find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

1. Ensure supervision by a properly qualified, competent person.
2. The assigned competent person shall verify training, medical, and PPE requirements for the asbestos workers are complete and current.
3. Notify and coordinate task with proper officials (facility manager, work area supervisor, OHD, Environmental Office as needed).
4. Notify OHD at least 2 weeks before job start to coordinate inspections and air sampling.
5. Establish regulated area, post warning signs, and rope off area with barricade tape.
6. Shut down and isolate the HVAC system. Control operation/energy with a JSC Form 19A, "WARNING – DO NOT OPERATE" tag.
7. Secure and isolate the electrical system and control its operation/energy with a JSC Form 19A, "WARNING – DO NOT OPERATE" tag. Disable the fire alarm systems as necessary and obtain approval for outages from the Fire Protection Coordination Office.
8. Clean and remove furniture and fixtures, if possible.
9. Pre-clean work area.
10. Seal stationary items, and any remaining furniture/fixtures, and surfaces with polyethylene.
11. Install containment system enclosure, critical barriers, floor coverings, and airlocks (airlocks are mandatory for large enclosures; a double entrance curtain ("Z" flap) is mandatory for small enclosures).
12. Secure work area.
13. Install decontamination area (equipment room, shower area, clean room) and waste load-out facilities, as required. .
14. Install negative-pressure air system (large-scale enclosure).
15. Install negative-pressure air or HEPA-vacuum system for negative pressure (small-scale enclosure).
16. Arrange for OHD to pre-inspect the enclosure.
17. Don protective equipment and clothing and respiratory protection.
18. Maintain HEPA vacuum system in standby mode (spot-removal surfacing).

Attachment 12A

Class I Asbestos Work (cont.)

19. Wet ACM.
20. Remove ACM
21. Conduct personnel and area sampling concurrently with removal of ACM.
22. Bag removed ACM.
23. Prepare bagged ACM for disposal. Decontaminate outside of bag.
24. Conduct cleaning and inspection following procedures in Chapter 12.
25. Arrange for OHD to perform initial inspection.
26. Re-clean, as necessary.
27. Conduct final cleanup following procedures in Chapter 12.
28. Apply encapsulant/"lockdown" to abatement and contiguous areas.
29. Arrange for OHD to conduct clearance visual inspection and clearance air sampling.
30. Decontaminate personnel and equipment by HEPA vacuum. Remove disposable protective clothing and bag as asbestos waste. Shower and exit through decontamination area as appropriate.
31. Disassemble enclosure/decontaminated system after approval from OHD.
32. Call Work Control Center to dispose of all ACM and asbestos-contaminated waste. Record Work Control Pickup Ticket number on Asbestos Work Permit.
33. Disestablish regulated area.
34. OHD to provide written notification to facility manager that area can be returned to routine activities.
35. Abatement contractor to write report/provide records to Environmental Office/Asbestos Program Manager, as required.

Attachment 12B

Class II Asbestos Work

Class II Asbestos Work: Removal of, or modification to, wallboard systems, asbestos concrete materials (e.g.; pipe, siding, roofing, transite board), ceiling tiles, wall tiles, floor tiles and sheeting, construction mastics, and roofing and siding shingles that are considered Asbestos Containing Material (ACM) or Presumed Asbestos Containing Material (PACM).

If you perform asbestos Class II abatement work involving the removal of equal to or greater than 160 square feet you shall (as required by Chapter 12.6):

(i) Submit an asbestos project design

(ii) Provide the JSC Environmental Office, at least 15 working days prior to beginning work, all information required to make notification to the TDSHS.

The JPR requirement descriptions listed in this attachment are the pre-approved project designs for asbestos Class II abatement activities involving less than 160 square feet of ACM or PACM.

Class II asbestos work operations, where exposures exceed a PEL, or where there is no negative exposure assessment approved by OHD before the operation starts, require an equipment room or area adjacent to the regulated area for the decontamination of employees and their equipment. The area shall be covered by a impermeable drop cloth on the floor or horizontal working surface and shall be of sufficient size as to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area (as determined by visible accumulations). (Reference 29 CFR 1926.1101(j)(2)).

Tasks under Class II consist of removing wallboard, asbestos concrete materials (e.g.; pipe, siding, roofing, transite board), ceiling tiles, wall tiles, floor tiles and sheeting, roofing, and siding shingles (i.e., ACM or PACM other than TSI and surfacing materials), regardless of quantity, where these materials have been identified as containing greater than 1% asbestos. Although these materials contain in excess of 1% asbestos, they are typically classified as non-friable. The removal of these materials is separated into two categories based on exposure plus two specific tasks for the removal of resilient flooring using RFCI methods.

JPR II-1: The first category is where work activities will destroy the integrity of the ACM and cause the release of asbestos fibers. The materials being removed constitute a significant source of ACM, and abatement could reasonably be expected to contaminate adjoining facilities and create airborne concentrations if proper controls are not followed. The airborne exposures are likely to exceed (>) 0.01 f/cc, or an approved negative exposure assessment is not available. These removal projects will require the use of small or large enclosures. Enclosures will require the use of an equipment room.

JPR II-2: The second category is where work activities will not compromise or damage the integrity of the ACM. The materials being removed do not constitute potentially significant airborne fibers if removed intact and controlled. The airborne exposures likely to be less than (<) 0.01 f/cc, or an approved negative exposure assessment is available. An enclosure may be necessary, but is not always required.

Class II Asbestos Work (cont.)

To accomplish these two categories of tasks, a number of sequential and concurrent steps are required. The most prominent of these are listed below. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

1. Ensure supervision by a properly qualified, competent person.
2. The assigned competent person shall verify training, medical, and PPE requirements for the asbestos workers are complete and current.
3. Notify and coordinate task with proper officials (facility manager, work area supervisor, OHD, Environmental Office as needed).
4. For routine and scheduled O&M work, notify OHD at least 2 weeks before job start to coordinate inspections and air sampling.
5. Establish regulated area, post warning signs, and rope off area with barricade tape.
6. Shut down and isolate the HVAC system. Control operation/energy with a JSC Form 19A, "WARNING - DO NOT OPERATE" tag.
7. Secure and isolate the electrical system and control its operation/energy with a JSC Form 19A, "WARNING - DO NOT OPERATE" tag. Disable the fire alarm systems as necessary and obtain approval for outages from the Fire Protection Coordination Office.
8. Clean and remove furniture and fixtures.
9. Pre-clean work area.
10. Seal stationary items with polyethylene.
11. Install containment system, critical barriers, coverings, and airlocks (airlocks are mandatory for large enclosures; a double entrance curtain ("Z" flap) is mandatory for small enclosures).
12. Secure work area.
13. Install equipment room (as necessary).
14. Install negative-pressure air or HEPA-vacuum system for negative pressure (as necessary).
15. Arrange for the OHD to pre-inspect the enclosure.
16. Don protective equipment and clothing and respiratory protection.
17. Wet ACM.
18. Remove ACM.
19. Conduct personnel and area sampling concurrently with removal of ACM.
20. Bag removed ACM.
21. Prepare bagged ACM for disposal. Decontaminate outside of bag.
22. Conduct cleaning and inspection following procedures in Chapter 12.12.

Class II Asbestos Work (cont.)

23. Arrange for OHD to conduct initial visual inspection.
24. Re-clean, as necessary.
25. Conduct final cleanup following procedures in Chapter 12.12.
26. Apply encapsulant/"lockdown" to abatement and contiguous areas.
27. Arrange for OHD to conduct clearance visual inspection and clearance air sampling.
28. Decontaminate personnel and equipment by HEPA vacuum. Remove disposable protective clothing and bag as asbestos waste. Shower and exit through change room as appropriate.
29. Disassemble enclosure/decontamination system after approval from OHD.
30. Call Work Control Center to dispose of all ACM and asbestos-contaminated waste.
31. Disestablish regulated area. Record Work Control Pickup Ticket number on Asbestos Work Permit.
32. OHD to provide written notification to facility manager that area can be returned to routine activities.
33. Abatement contractor to write report/provide records to Environmental Office, as required.

JPR II-3: Removal of less than 160 square feet of resilient sheet flooring using methods and procedures specified by the RFCI to include: (i) ACM sheeting or (ii) sheeting with ACM backing felt or adhesive. Sheeting must be cut with a box-cutter or linoleum-knife into narrow strips and rolled up without breaking using wet methods. Since the removal of the resilient sheet flooring will most likely involve an entire room or rooms, critical barriers and entry curtains are mandatory, as is polyethylene sheeting on the lower half of the walls. If the RFCI procedures are not strictly followed, removal must be conducted under JPR II-1.

JPR II-4: Removal of resilient flooring using methods and procedures specified by the RFCI to include: (i) any ACM vinyl or asphalt tile or (ii) any vinyl or carpet tile with ACM mastic; where the area exceeds 40 ft^2 , or where waste will exceed the capacity of one standard glove bag, but involves less than 160 square feet. Critical barriers and entry curtains are mandatory, as is polyethylene sheeting on the lower half of the walls. Tiles must be removed **intact**. Removal procedures must not use spud bars or Mechanical chippers. If these conditions are not or cannot be met, removal must be conducted under JPR II-1.

The RFCI document "Recommended Work Practices for Removal of Resilient Floor Coverings" may be found at http://www.rfci.com/index.php. See the TDSHS statement concerning RFCI procedures at: http://www.dshs.state.tx.us/asbestos/pdf/ARC022.pdf. RFCI procedures prohibit sanding, sawing, drilling, grinding, abrasive blasting, bead blasting, dry sweeping, dry scraping, and mechanical chipping or pulverizing of resilient flooring, lining, backing felt, and adhesive materials.

Class II Asbestos Work (cont.)

To accomplish these two specific tasks, a number of sequential and concurrent steps are required. The most prominent of these are listed below. Workers will wear protective clothing and respiratory protection. Find specific details for performing all required activities by referring to the accepted RFCI industry practices and procedures.

1. Ensure supervision by a properly qualified, competent person.
2. The assigned competent person shall verify training, medical, and PPE requirements for the asbestos workers are complete and current.
3. Notify and coordinate task with proper officials (facility manager, work area supervisor, OHD, Environmental Office as needed).
4. For routine and scheduled O&M work, notify OHD at least 2 weeks before job start to coordinate inspections and air sampling.
5. Notify JSC Environmental Office (JE) at least 15 working days before the job if the project exceeds EPA (Clean Air Act/NESHAP) criteria of greater than 160 ft^2 for removal of ACM for them to make required regulatory notifications to the TDSHS.
6. Establish regulated area, post warning signs, and rope off area with barricade tape.
7. Clean and remove furniture and fixtures.
8. Pre-clean work area.
9. Seal stationary items with polyethylene.
10. Install containment system, critical barriers, coverings, and airlocks (airlocks are mandatory for large enclosures; a double entrance curtain ("Z" flap) is mandatory for small enclosures).
11. Secure work area.
12. Install equipment room (as necessary).
13. Install negative-pressure air or HEPA vacuum system for negative pressure (as necessary).
14. Arrange for the OHD to pre-inspect the regulated area.
15. Prepare amended water/detergent solution using RFCI directions.
16. Don protective equipment and clothing and respiratory protection.
17. Remove resilient sheet flooring using RFCI methods:
    a. If sheeting is fully-adhered, cut into strips that are 4 to 8 in. wide. Use these narrow strips for the bonded areas/edges of peripherally adhered sheeting.
    b. If sheeting has not adhered or is peripherally adhered, cut areas that are not bonded into strips that are 18 in. wide.
    c. While one worker rolls up the strip, a second worker keeps the sheeting, and especially the backing felt, wet with water/detergent solution.

d. For fully adhered sheeting, the backing felt will separate from the wear layer. If separation does not occur easily, use wet-scraping to achieve separation.

e. After removing a 12- to 18-in. width of sheeting, thoroughly saturate any residual backing felt and remove by wet-scraping. Rewet backing felt if water/detergent solution has not completely penetrated.

f. Place rolled-up flooring and wet backing felt into ACM waste bags.

g. After the 12- to 18-in. width is free of backing felt, HEPA-vacuum the cleaned area.

h. Repeat a–g, above, until sheeting and backing felt have been removed from the entire floor.

18. Remove floor tiles using RFCI methods:

    a. Wet floor tile with water/detergent solution.

    b. Using one of the RFCI methods, carefully remove floor tiles one at a time, keeping them intact. The RCFI methods are:

    - Wet floor tile with water/detergent solution; work a short- or long-handled scraper beneath a floor tile to exert pressure in a twisting action.
    - Thoroughly heat tile with a hot air gun or radiant heat source to soften tile and adhesive, then remove by hand or with scraper.
    - Place removed tiles into ACM waste bags with water/detergent solution.

19. Remove carpet tiles that have been adhered to floor with ACM mastic. Pry or peel up carpet tiles, keep mastic wet with water/detergent solution. Place contaminated carpet tiles into ACM waste bags with water/detergent solution.

20. Remove residual ACM mastic using RFCI wet-scraping methods and/or adhesive solvents and place into ACM waste bags. RFCI methods allow the use of adhesive solvents with a slow-speed (i.e., less than 300 rpm) floor machine and a 3M black floor pad. If using an adhesive solvent, exhaust ventilation will be required.

21. Conduct personnel and area sampling concurrently with removal of ACM.

22. Prepare bagged ACM for disposal.

23. Conduct cleaning and inspection following procedures in Chapter 12.12.

24. Arrange for OHD to conduct initial visual inspection.

25. Re-clean, as necessary.

26. Conduct final cleanup following procedures in Chapter 12.12.

27. Arrange for OHD to conduct clearance visual inspection and clearance air sampling, as required.

28. Decontaminate personnel and equipment by HEPA vacuum. Remove disposable protective clothing and bag as asbestos waste.

Class II Asbestos Work (cont.)

29. Disassemble enclosure/decontamination system after approval from OHD.
30. Call Work Control Center to dispose of all ACM and asbestos-contaminated waste.
31. Disestablish regulated area. Record Work Control Pickup Ticket Numberr on Asbestos Work Permit.
32. OHD to provide written notification to facility manager that area can be returned to routine activities.
33. Abatement contractor to write report/provide records to Environmental Office, as required.

Attachment 12C

Class III Asbestos Work – Glovebag

Class III Asbestos Work – Glovebag: Removal of piping insulation using a glovebag to control the expected airborne asbestos.

JPR III-1: Removal or repair of ACM or PACM insulation of less than (<) 3 linear feet at a single spot from steam, chilled water, and hot water lines and valves. Waste is limited to the amount of ACM or PACM that can be safely contained within one glovebag or within one standard waste bag. This job consists of conducting repairs and maintenance to pipes, lines, and valves. To gain access to the defective part of the pipe, line, or valve, it may be necessary to remove asbestos insulation from the item. The normal high asbestos content of these materials makes it reasonable to expect airborne concentrations of asbestos in potentially significant levels when these materials are disturbed. If the item to be worked on is small enough to fit in a glovebag and there is sufficient room for tools and necessary manipulation, use the glovebag method.

If the operation cannot be conducted in one glovebag, or if the total asbestos waste exceeds the capacity of one glovebag or one standard asbestos disposal bag, the work must be done following procedures under Class I Asbestos Work, JPR I-2 or I-4.

Accomplishing this job requires a number of sequential and concurrent steps. The most prominent of these are listed below. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

c. Ensure supervision by a properly qualified, competent person.

d. The assigned competent person shall verify that training, medical, and PPE requirements of the asbestos workers are complete and current.

e. Notify and coordinate job task with proper officials (facility manager, work area supervisor, and OHD).

f. Establish regulated area, post warning signs, and rope off area with barricade tape.

g. Secure electrical systems, if possible without undue disruption to work activities if in close proximity to work area. If necessary, disable fire alarm system by coordinating with the Fire Protection Coordination Office.

h. Pre-clean the work area.

i. Seal stationary items with polyethylene.

j. Cover surface areas under abatement area with 6-mil polyethylene.

k. Don protective equipment and clothing and respiratory protection.

l. Perform glovebag operations.

   a. Install glovebag.

   b. Establish containment negative-pressure air flow with HEPA vacuum.

   c. Remove ACM using wet methods.

Class III Asbestos Work – Glovebag (cont.)

d. Scrub and wipe down exposed piping/valves.

e. Use encapsulant or "lockdown" on abatement and contiguous areas.

f. Remove glovebag.

m. Clean area.

n. Perform inspection and conduct final cleanup following procedures in Chapter 12.12.

o. Decontaminate and remove protective equipment.

p. Call Work Control Center to dispose of all ACM and ACM-contaminated materials. Record Work Control Pickup Ticket Number on Asbestos Work Permit.

q. Disestablish regulated area.

r. Notify facility manager of job completion.

Attachment 12D

Class III Asbestos Work – Regulated Area Defined By Barricade with Floor Covering

Class III - Asbestos Work – Regulated Area Defined by: A Barricade With Floor Covering:

This set of Class III Asbestos work requires a regulated area defined by barrier or tape and warning signs. The regulated area does not require an enclosure but does require appropriate covering of horizontal surfaces with polyethylene sheeting.

If at any time during the tasks described below, ACM is noted as delaminating or creating airborne fibers, stop the project and immediately upgrade it to Class I or Class II asbestos work.

JPR III-2: Activities which meet one or more of the following:

a. Any entry into a ceiling plenum below surfacing or spray applied insulation/fireproofing (SAI) ACM or PACM where the ceiling opening is less than (<) 32 square feet;

b. Any activity that disturbs (e.g., moves) ACM or PACM ceiling tiles below a plenum that does not contain surfacing or SAI ACM or PACM where the ceiling opening is < 32 square feet.

JPR III-3: Activities involving the removal of ACM or PACM where the waste generated does not exceed the capacity of a standard asbestos waste bag. These activities involve the:

a. Spot removal of ACM or PACM wallboard, joint tape, or joint compound

b. Removal, replacement and disposal of ACM or PACM ceiling tiles below a plenum which does not contain surfacing or SAI ACM or PACM and where the ceiling opening is < 32 square feet.

The materials being removed have been identified as containing (or are presumed to contain) greater than 1% asbestos, constitute a potential source of ACM, and abatement could reasonably be expected to contaminate adjoining areas if proper work practices are not followed. Wet methods are mandatory and the ACM or PACM must be captured close to the removal activity and transferred to a waste bag. If waste exceeds the capacity of a standard asbestos waste bag, then Class II Asbestos work, JPR II-1 or II-2 must be used.

Accomplishing these jobs requires a number of sequential and concurrent steps. The most prominent of these are listed below. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

1. Ensure supervision by a properly qualified, competent person.
2. The assigned competent person shall verify that training, medical and PPE requirements of the asbestos workers are complete and current.

Class III Asbestos Work – Regulated Area Defined By Barricade with Floor Covering (cont.)

3. Notify and coordinate job tasks with proper officials (facility manager, work area supervisor, and OHD).
4. Establish regulated area. Place barricades and signs around work area. Barricades must be placed a sufficient distance beyond the work zone to capture all debris from work activities and to ensure that no asbestos concentration exceeds applicable limits.
5. Move employees out of the regulated area.
6. Shut down HVAC system if possible without unduly interrupting facility work force. The HVAC system must be shut down when disturbance of ACM or ACM containing debris could reasonably be expected to migrate to other areas.
7. Don protective equipment and clothing and respiratory protection.
8. Conduct personnel and area sampling as required.
9. Place one layer of 6-mil polyethylene beneath work area. The polyethylene must extend beyond the work zone a sufficient distance to catch/trap any asbestos debris that may fall. If removing ceiling tiles, place polyethylene sheeting at least one ceiling tile beyond the opening in each direction. Move the boundary of the regulated area as necessary to ensure the polyethylene sheeting does not extend beyond the boundary..
10. When removing ceiling tiles:
    a. Place ladder below first ceiling tile.
    b. As tile is lifted, HEPA vacuum the tile grid supports.
    c. Remove one ceiling tile. Lower carefully, maintaining horizontal orientation.
    d. HEPA vacuum and wet wipe surface facing plenum and exposed side(s).
    e. Wet wipe and HEPA vacuum tile hanger assembly.
    f. HEPA vacuum next tile to be removed, remove next tile, and wet wipe and HEPA vacuum tile hanger assembly.
    g. Repeat for a maximum of three tiles (less than 32 square feet).
    h. If unable to decontaminate tile, or if ACM or PACM tiles are being removed/disposed, place in asbestos waste disposal bag.
11. If performing spot removals/abatements of SAI, or acoustical decoration, or wallboard, tape, and mud:
    a. Spray spot and surrounding area with amended water and let it soak into the ACM.
    b. Cut with sharp knife or other tool so as not to generate asbestos fibers. Use a HEPA vacuum adjacent to the cutting tool to capture asbestos fibers/dust.
    c. Catch asbestos waste in container held close to removal spot/area.
    d. Clean substrate, as applicable.

Class III Asbestos Work – Regulated Area Defined By Barricade with Floor Covering (cont.)

e. Spray/mist substrate and exposed side(s) of ACM with approved encapsulant.

12. If applicable, modify structural components so as not to disturb surrounding ACM.
13. If applicable, carefully remove wall partitions or plaster ceiling materials so as to not disturb surrounding ACM. Remove material and dispose of as normal waste or as directed.
14. As applicable, perform work in plenum above suspended ceilings.
15. When the plenum area is below surfacing or SAI ACM or PACM, wet wipe all cables, wires, conduit, and piping as they are removed from plenum area. HEPA vacuum all other items as they are removed from plenum area.
16. HEPA vacuum work area.
17. Visually inspect above ceiling and/or around work area, to ensure that there is no remaining visible ACM or PACM dust/debris.
18. Replace ceiling tiles, as applicable
19. Visually inspect and clean the regulated area and all equipment to ensure there is no visible ACM dust/debris. Follow cleaning and inspection procedures of Chapter 12.12.
20. Decontaminate personnel and all equipment by HEPA vacuum.
21. HEPA vacuum and wet wipe polyethylene placed beneath work area. If unable to decontaminate, carefully gather plastic and dispose as asbestos-contaminated waste. Follow cleaning and inspection procedures of Chapter 12.
22. Conduct final visual clearance inspection. Reclean as necessary.
23. Decontaminate disposable coveralls, remove, and dispose of as asbestos-contaminated waste.
24. Remove respirator.
25. Call Work Control Center to dispose of all ACM and ACM-contaminated materials. Record Work Control Pickup Ticket Number on Asbestos Work Permit. Notify area supervisor that task is complete.
26. Remove barricades and signs and disestablish regulated area.
27. Notify Facility Manager of job completion.

Class III Asbestos Work – Regulated Area Defined by an Enclosure

Class III - Asbestos Work – Regulated Area Defined by an Enclosure:

If at any time during the tasks described below, ACM is noted as delaminating or creating airborne fibers, stop the project and immediately upgrade it to Class I or Class II asbestos work.

JPR III-4: Spot removal of surfacing ACM or PACM (e.g., SAI or acoustical or decorative) of less than 3 square feet in contiguous area at a single spot, and the waste generated does not exceed the capacity of one standard asbestos waste bag per individual spot. The materials being removed have been identified as, or are presumed as, containing greater than 1% asbestos, constitute a potential source of ACM, and abatement could reasonably be expected to contaminate adjoining areas if proper work practices are not followed. Wet methods are mandatory and the ACM must be captured close to the removal activity and transferred to a waste bag.

JPR III-5: Activities which meet one or more of the following:

a. Any activity in close proximity (i.e., within 24 inches) of surfacing ACM or PACM.

   These jobs may consist of modifying building components (e.g.; steel or concrete structural members; steel or concrete decking) that is in close proximity to SAI for which drilling, hammering, or similar activities could be reasonably expected to disturb the ACM. When it is necessary to drill through or hammer steel that is in proximity to ACM that could be disturbed by the construction or maintenance activity, take precautions to minimize the quantity of asbestos released. Precautions would include evacuating nonessential personnel within the area of the activity, and wetting ACM before work to prevent fiber release.

   These jobs may consist of removing and/or replacing wall partitions in close proximity to asbestos materials and could be reasonably expected to disturb the ACM. Airborne asbestos concentrations are expected to be minimal if proper control procedures are followed.

b. Any entry into a ceiling plenum below surfacing or spray applied insulation/fireproofing (SAI) ACM or PACM where the ceiling opening is greater than or equal to ($\geq$) 32 square feet.

c. Any activity that disturbs (e.g., moves) ACM or PACM ceiling tiles below a plenum that does not contain surfacing or SAI ACM or PACM where the ceiling opening is $\geq$ 32 square feet.

Accomplishing these jobs requires a number of sequential and concurrent steps. The most prominent of these are listed below. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

1. Ensure supervision by a properly qualified, competent person.

Class III Asbestos Work – Regulated Area Defined By An Enclosure (cont.)

2. The assigned competent person shall verify that training, medical and PPE requirements of the asbestos workers are complete and current.
3. Notify and coordinate job tasks with proper officials (Facility Manager, Work Area Supervisor, and OHD).
4. Place barricades and signs around work area.
5. Move employees in the immediate work area out of the regulated area.
6. Shut down HVAC system if possible without unduly interrupting facility work force. The HVAC system must be shut down when disturbance of ACM or ACM containing debris could reasonably be expected to migrate to other areas.
7. Don protective equipment and clothing and respiratory protection.
8. Conduct personnel and area sampling as required.
9. Construct mini-enclosure with polyethylene, incorporate an air-lock or double entrance curtain ("Z" flap). A "pop-up" (e.g., "Kontrol-Kube™") enclosure will meet this requirement.
10. Pre-clean area as necessary.
11. As necessary, use HEPA vacuum to create a negative pressure inside enclosure.
12. If removing ceiling tiles:
    a. Place ladder below first ceiling tile.
    b. As tile is lifted, HEPA vacuum the tile grid supports.
    c. Remove one ceiling tile. Lower carefully, maintaining horizontal orientation.
    d. HEPA vacuum and wet wipe surface facing plenum and exposed side(s).
    e. Wet wipe and HEPA vacuum tile hanger assembly.
    f. HEPA vacuum next tile to be removed, remove next tile, and wet wipe and HEPA vacuum tile hanger assemble
    g. Wet wipe and HEPA vacuum tile hanger assembly.
    h. Repeat as necessary for all tiles to be removed.
    i. If unable to decontaminate tile, or if ACM or PACM tiles are being removed/disposed , place in asbestos waste disposal bag.
13. If applicable, modify structural components so as not to disturb surrounding ACM.
14. If applicable, carefully remove wall partitions so as to not disturb surrounding ACM. Remove material and dispose of as normal waste or as directed.
15. As applicable, perform work in plenum above suspended ceilings.

Class III Asbestos Work – Regulated Area Defined By An Enclosure (cont.)

16. When the plenum area is below surfacing or SAI ACM or PACM, wet wipe all cables, wires, conduit, and piping as they are removed from plenum area. HEPA vacuum all other items as they are removed from plenum area.
17. HEPA vacuum work area.
18. Visually inspect above ceiling, around work area, to ensure that there is no remaining visible ACM dust/debris.
19. Replace ceiling tiles.
20. Perform first visual inspection of the regulated area and all equipment below ceiling to ensure there is no visible ACM dust/debris.
21. Decontaminate personnel and all equipment by HEPA vacuum.
22. Clean, inspect, decontaminate enclosure following Chapter 12.12 procedures.
23. Conduct visual clearance inspection. Reclean as necessary.
24. Disassemble enclosure, perform final visual inspection of area, clean as necessary.
25. Decontaminate disposable coveralls, remove, and dispose of as asbestos-contaminated waste.
26. Remove respirator.
27. Call Work Control Center to dispose of all ACM and ACM-contaminated materials. Record Work Control Pickup Ticket Number on Asbestos Work Permit.
28. Remove signs and disestablish regulated area.
29. Notify Facility Manager of job completion.

JPR III-6: Removal of plaster and sheetrock ceilings below the ceiling plenum in buildings with ACM or PACM surfacing or spray applied insulation/fireproofing (SAI) .

This job consists of work activities to remove plaster and sheetrock ceilings below the ceiling plenums in buildings with asbestos containing spray applied insulation (SAI). The plaster is most often used with a wire-mesh support. The wire mesh or sheetrock supports may be suspended by wires from the overhead deck. The top side of the plaster or the sheetrock is assumed to be contaminated with asbestos debris. Removal of the plaster or sheetrock will create significant amounts of dust and debris which could contain some asbestos debris. Partial to whole-body entry into the plenum is required for some or all of the plaster/sheetrock ceiling removal. Asbestos concentrations are reasonably expected to be low if proper precautions and procedures are incorporated into job planning. This task does not include the abatement of any ACM SAI, but has the potential to disturb the ACM SAI if precautions are not taken.

Accomplishing these jobs requires a number of sequential and concurrent steps. The most prominent of these are listed below. Find specific details for performing all required activities by

Class III Asbestos Work – Regulated Area Defined By An Enclosure (cont.)

referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

1. Ensure supervision by a properly qualified, competent person.
2. The assigned competent person shall verify that training, medical and PPE requirements of the asbestos workers are complete and current.
3. Notify and coordinate job tasks with proper officials (Facility Manager, Work Area Supervisor, and OHD).
4. Place barricades and signs around work area.
5. Move employees in the immediate work area out of the regulated area.
6. Shut down HVAC system if possible without unduly interrupting facility work force. The HVAC system must be shut down when disturbance of plaster/sheetrock dust and ACM containing debris could reasonably be expected to migrate to other areas.
7. Remove furniture and fixtures. Pre-clean area as necessary. Seal stationary items with polyethylene if they cannot be removed.
8. Construct enclosure with polyethylene sheeting.
    a. Seal edges of enclosure and cover HVAC system vents to prevent escape of dust and debris.
    b. Install an air-lock vestibule.
    c. Install a waste load-out area if needed.
    d. If ceiling is being removed from an entire room, cover the walls with a single layer of at least 6-mil polyethylene.
    e. Cover the floor of the enclosure with two layers of at least 6-mil polyethylene.
9. Install negative-pressure air machine (large enclosure) or HEPA vacuum (small enclosure) to create a negative pressure of at least -0.02 inches H2O inside enclosure.
10. Arrange for OHD to inspect enclosure before work begins.
11. Don protective equipment and clothing and respiratory protection before entering the enclosure.
12. Conduct personnel and area sampling as required.
13. Remove ceiling:
    a. Gain entry to ceiling through hatch, if one exists.
    b. Otherwise, select a location to cut an opening and place ladder/work stand below. Wet the cut-line then cut opening through ceiling. Use a vacuum, HEPA (with a design used for wet application to mitigate shock hazard) to catch/collect dust generated during the cutting process. Carefully lower the cut out piece of ceiling, maintaining horizontal orientation. HEPA vacuum the surface facing plenum.

Class III Asbestos Work – Regulated Area Defined By An Enclosure (cont.)

c. HEPA vacuum the top of the next ceiling area to be removed and then cut it out.

- Minimize generation of plaster/sheetrock dust and debris.
- Wet top and bottom surfaces to be cut.
- Catch or collect dust generated by the cutting process with a HEPA vacuum.
- Avoid, as much as possible, partial cutting and/or tearing down the ceiling since this creates more plaster/sheetrock dust and debris.

d. Repeat as necessary for all of ceiling area being removed.

e. Control plaster/sheetrock dust inside enclosure with water mist.

14. Double bag and dispose of all plaster and sheetrock waste as asbestos waste. Wet all debris as it is being bagged. Place a JSC Form 1161, "Disposal Inventory for Miscellaneous Hazardous Waste," on each waste bag. See waste disposal procedures/process in Chapter 12.14.
15. If applicable, modify structural components so as not to disturb surrounding ACM.
16. Wet wipe all cables, wires, conduit, and piping as they are removed from plenum area. HEPA vacuum all other items as they are removed from plenum area. .
17. Clean, inspect, decontaminate enclosure following Chapter 12.12 procedures.
18. Conduct visual inspection of the enclosure and all equipment below the ceiling plane. Reclean as necessary.
19. Arrange for OHD to conduct a visual clearance inspection.
20. Install new ceiling and perform other construction work.
    a. As long as the ceiling remains open to the ACM SAI then all work will be conducted using Class III Asbestos Work procedures as described in JPRs III-4 or III-5.
    b. Removal/Abatement of any surfacing, SAI, or TSI ACM or PACM SAI will be conducted using JPRs I-1through I-4, as appropriate. If the abatement activities involve amounts equal to or greater than (≥) 260 linear feet, 160 square feet, or 35 cubic feet of ACM or PACM, then submit an asbestos project design and provide the JSC Environmental Office, at least 15 working days prior to beginning work, all information required to make notification to the TDSHS.
21. After new ceiling is completely installed, conduct visual inspection and clean/reclean as necessary.
22. Arrange for OHD to perform a final visual clearance visual inspection and clearance air sampling.
23. Disassemble the enclosure and perform final visual inspection of area, clean as necessary.
24. Decontaminate equipment by HEPA vacuuming and wet wiping.

Class III Asbestos Work – Regulated Area Defined By An Enclosure (cont.)

25. Decontaminate personnel and disposable coveralls, remove, and dispose of as asbestos-contaminated waste.
26. Remove respirator.
27. Call Work Control Center to dispose of all ACM and ACM-contaminated materials. Record Work Control Pickup Ticket Number on Asbestos Work Permit and on the JSC Forms 1161.
28. Remove signs and disestablish regulated area.
29. Notify Facility Manager of job completion.
30.

Attachment 12F

Class III Asbestos Work – Other

Class III Asbestos Work – Other: Other Class III asbestos-related work where the activities cannot be easily grouped into a specific type of regulated area. The Asbestos Competent Person for the activity will determine the extent and construction of the regulated area.

JPR III-7: Repair or maintenance of equipment with ACM or PACM to include: (i) equipment that has ACM or PACM insulation, or (ii) replacement and removal of ACM or PACM gaskets. These activities involve:

a. The repair and maintenance of equipment (motors, engines, relays, ovens, file cabinets, etc.) that has ACM or PACM inside the unit. It does not cover equipment with ACM insulation on the outside, which must be removed before gaining access to the interior of the unit. Airborne concentrations of asbestos fibers are reasonably expected to be less than 0.1 f/cc. If equipment is known to contain asbestos and there is no intention of servicing the equipment or removing the asbestos, the equipment must be disposed of as asbestos waste through the FSS contractor (i.e., it cannot be disposed of or declared excess through the JSC Logistics Division).

b. Removing ACM or PACM gasket materials from valves and pipe flanges. This job does not include removing ACM or PACM from the outside of the valve or pipe joint. (Removing ACM from outside of the valves and pipe joints will be conducted under Class I asbestos work, JPRs I-2 and I-4, or Class III asbestos glovebag work, JPR III-1, as appropriate). Airborne concentrations of asbestos fibers are reasonably expected to be less than 0.1 f/cc if proper controls are followed.

This job requires a number of sequential and concurrent steps. The most prominent of these are listed below. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

1. Ensure supervision by a properly qualified, competent person.
2. The assigned competent person shall verify that training, medical, and PPE requirements of the asbestos workers are complete and current.
3. Notify proper offices
4. Establish regulated area
5. Place barricades and signs around work area
6. Place one layer of 6-mil polyethylene under (around, if equipment is floor mounted) equipment to be repaired.
7. Don protective clothing and respirator.
    a. As appropriate, disassemble valve or pipe flange. HEPA-vacuum/wet-wipe valve-gasket interfaces.
    b. Scrape off and collect ACM gasket materials using wet methods.

c. Bag ACM.

d. HEPA-vacuum/wet-wipe flange surfaces.

e. Install new gasket.

f. Reassemble valve piping.

g. HEPA-vacuum/wet-wipe outside of valve and surrounding area.

8. As appropriate, open equipment

   a. HEPA vacuum interior.

   b. Wet ACM material.

   c. Remove ACM (if necessary) and place in ACM waste bag, if being discarded. Replace with non-ACM if feasible.

   d. Repair equipment.

   e. HEPA vacuum interior.

   f. Close up equipment.

9. HEPA-vacuum polyethylene and visually inspect regulated area.

10. Clean and inspect work area following procedures in Chapter 12.12 .

11. Place all rags, materials, polyethylene, and vacuum cleaner bags into ACM waste bags.

12. HEPA-vacuum disposable work clothes. Remove protective clothing and dispose of as asbestos-contaminated waste.

13. Remove, clean, and store respirator.

14. Call Work Control Center to dispose of asbestos-contaminated waste. Record Work Control Pickup Ticket Number on Asbestos Work Permit.

15. Notify supervisor that task is complete.

16. Remove barricades and signs and disestablish regulated area.

JPR III-8: Maintenance of equipment used in asbestos abatement or decontamination work.

This task includes replacing filters and maintaining equipment used in ACM abatement and decontamination operations. This would generally include negative-pressure air filtration, water filters, and HEPA-equipped vacuum cleaners. These filters would generally be expected to contain significant quantities of ACM; consequently, these units may need to be serviced within a small enclosure. When not in service, secure HEPA vacuum cleaners and negative-pressure, air-filtration equipment with plastic on each inlet and exhaust opening to the unit.

Accomplishing these jobs requires a number of sequential and concurrent steps. The most prominent of these are listed below. Specific details for performing all required activities may be

Class III Asbestos Work – Other (cont.)

found by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

1. Ensure supervision by a properly qualified, competent person
2. The assigned competent person shall verify that training, medical, and PPE requirements of the asbestos workers are complete and current.
3. Coordinate job tasks with proper officials.
4. Secure HVAC and electrical systems, as necessary. Ensure equipment is de-energized. Perform LO/TO procedures as appropriate.
5. Move employees in the immediate work area out of the controlled area.
6. Place barricades and signs around work area. Build enclosure as needed. Place polyethylene sheeting on work surface.
7. Don protective clothing and respirator.
8. Open filter unit.
9. HEPA-vacuum/wet-wipe filter unit covers and duct.
10. Spray filter with mist of water or a tack coating.
11. Ensure complete filter surface is covered.
12. Place filter into plastic bag, seal bag, and label as asbestos waste.
13. HEPA-vacuum/wet-wipe filter installation area.
14. Install new filter.
15. Close unit.
16. Clean and inspect work area following procedures in Chapter 12.12.
17. HEPA-vacuum work area including plastic sheeting placed beneath work area.
18. Disassemble enclosure.
19. Collect decontaminated plastic sheeting placed beneath work area, place in waste bags, and dispose of as normal refuse.
20. Conduct visual clearance inspection.
21. HEPA-vacuum work area and protective clothing. Remove protective clothing and dispose of as asbestos-contaminated waste.
22. Remove, clean, and store respirator.
23. Call Work Control Center to dispose of asbestos-contaminated waste. Record Work Control Pickup Ticket Number on Asbestos Work Permit.
24. Notify area supervisor that task is complete.
25. Remove barricades and signs.

Class III Asbestos Work – Other (cont.)

JPR III-9: Removal of (i) ACM vinyl/asphalt floor tile; (ii) non-ACM floor tile with ACM mastic; or (iii) carpet tiles with ACM mastic using procedures and methods specified by the RFCI. Waste is limited to one standard waste bag.

Tiles must be removed **intact**. Removal procedures must not use spud bars or mechanical chippers. If these conditions are not or cannot be met, removal must be conducted under JPR II-1.

The RFCI document "Recommended Work Practices for Removal of resilient Floor Coverings" may be found at http://www.rfci.com/index.php. See the TDSHS statement concerning RFCI procedures at: http://www.dshs.state.tx.us/asbestos/pdf/ARC022.pdf. RFCI procedures prohibit sanding, sawing, drilling, grinding, abrasive blasting, bead blasting, dry sweeping, dry scraping, and mechanical chipping or pulverizing of resilient flooring, lining, backing felt, and adhesive materials.

To accomplish this task, a number of sequential and concurrent steps are required. The most prominent of these are listed below. Workers will wear protective clothing and respiratory protection. Find specific details for performing all required activities by referring to the accepted RFCI industry practices and procedures.

1. Ensure supervision by a properly qualified, competent person
2. The assigned competent person must verify training, medical, and PPE requirements of the asbestos workers are complete and current.
3. Notify proper offices.
4. Ensure supervision by a properly qualified competent person.
5. Establish regulated area, post warning signs, and rope off area with barricade tape.
6. ***Pre-clean work area***.
7. Prepare amended water/detergent solution using RFCI directions.
8. Don protective clothing and respiratory protection.
9. Remove floor tiles using RFCI methods:
    a. Wet floor tile with water/detergent solution.
    b. Using one of the RFCI methods, carefully remove floor tiles one at a time, keeping them intact. The RCFI methods are:
        - Wet floor tile with water/detergent solution; work a short- or long-handled scraper beneath a floor tile to exert pressure in a twisting action

Class III Asbestos Work – Other (cont.)

- Thoroughly heat tile with a hot air gun or radiant heat source to soften tile and adhesive, then remove by hand or with scraper
- Place removed tiles into ACM waste bags with water/detergent solution

10. Remove carpet tiles that have adhered to floor with ACM mastic. Pry or peel up carpet tiles, keep mastic wet with water/detergent solution. Place contaminated carpet tiles into ACM waste bags with water/detergent solution.
11. Remove residual ACM mastic using RFCI wet-scraping methods and/or adhesive solvents and place into ACM waste bags. RFCI methods allow use of adhesive solvents with a slow-speed (i.e., less than 300 rpm) floor machine and a 3M black floor pad.
12. Prepare bagged ACM for disposal.
13. Visually inspect and clean the regulated area and all equipment to ensure that there is no visible ACM dust/debris. Follow cleaning and inspection procedures in Chapter 12.12.
14. Decontaminate personnel and all equipment by HEPA vacuum.
15. Conduct final visual clearance inspection. Re-clean as necessary.
16. Decontaminate, remove, and dispose of disposable coveralls as asbestos-contaminated waste.
17. Remove respirator.
18. Call Work Control Center to dispose of all ACM and ACM-contaminated materials. Record Work Control Pickup Ticket Number on Asbestos Work Permit. Notify area supervisor that task is complete.
19. Remove barricades and signs and disestablish regulated area.
20. Notify facility manager of job completion.

JPR III-13: Activities required to be performed under raised computer floor and sub-floor areas (i.e., system inspections, system repairs, system installations, cable installations or removals, and sub-floor cleaning) in buildings with SAI/fireproofing or exposed acoustical decoration.

a. This job consists of removing and/or replacing raised computer floor tiles for activities to be performed in sub-floor areas where the potential for asbestos dust exists. If proper control measures are followed, airborne asbestos concentrations are expected to be minimal.

b. Requirements of this JPR do not apply if activities do not require physical entry into sub-floor areas (physical entry is defined as happening when any part of a human body (arm, foot, head) breaks the plane of the flooring). For example, inspections of sub-floor areas from above the floor surface are not regulated under either this JPR or Part 12.

Class III Asbestos Work – Other (cont.)

Accomplishing this job requires a number of sequential and concurrent steps, regardless of the number of tiles to be removed. The most prominent of these are listed below. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

2. A competent person must verify that training, medical, and PPE requirements are complete and current.
3. Notify and coordinate job tasks with proper officials.
4. When feasible, shut down under-floor HVAC systems in the area. Perform operation/energy control procedures as needed (see Chapter 8.2 of this handbook).
5. Don protective clothing and respirator.
6. Remove floor tile panel and HEPA vacuum underside of panel.
7. Wet-wipe and/or HEPA-vacuum floor tile support assembly.
8. HEPA-vacuum the under-floor area where work is to be performed.
9. If activity is for removal of any under-floor equipment or cabling, HEPA-vacuum and/or wet-wipe all items as they are removed from the floor cavity.
10. Replace tiles as necessary.
11. Conduct visual clearance inspection.
12. HEPA-vacuum work area and protective clothing. Remove protective clothing and dispose of as asbestos-contaminated waste.
13. Remove, clean, and store respirator.
14. Call Work Control Center to dispose of asbestos-contaminated waste. Record Work Control Pickup Ticket Number on the Asbestos Work Permit.
15. Notify area supervisor that task is complete.

Attachment 12G

Class IV Asbestos Work

Class IV Asbestos Work:

The permit requirements, established in Chapter 12.1, are categorically waived for activities falling within this attachment. Notifications as required in Chapter 12.6 are waived unless debris is spotted and an Emergency Cleanup is initiated.

JPR IV-1: Changing air filters in comfort cooling or clean room systems in buildings with SAI/fireproofing.

a. Air-conditioning systems contain filters that must be routinely replaced. Comfort units usually have a 1- to 2-inch-thick polyethylene pad media. Some units have roll media that is advanced automatically based upon pressure differential. Units serving computers and electronics usually have a polyethylene-pad pre-filter and a 65% efficiency secondary filter. Clean room units usually have a pre-filter, a 65 % efficiency secondary, and an HEPA final filter. All pre-filters are changed on a periodic schedule established in the FSS contractor's preventive maintenance procedure. Secondary and HEPA filter are changed at established pressure differential points.

b. If units are above ceilings in a building with SAI, perform this activity using the appropriate Class III asbestos procedures from Appendix 12B, Attachments 12D and 12E.

Accomplishing these jobs requires a number of sequential and concurrent steps. The most prominent of these are listed below. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

1. A competent person is to verify that training, medical and PPE requirements are complete and current.
2. Coordinate job tasks with proper officials.
3. Secure HVAC and electrical systems. Perform operation/energy control procedures as needed (see Chapter 8.2 of this handbook).
4. Open air-handling unit filter bank/holder(s).
5. HEPA-vacuum/wet-wipe filter unit covers.
6. Wet-mist/spray filters as they are removed from the filter holders.
7. Place filters from building air-conditioning systems or similar applications in plastic bags and seal; you can dispose of them as normal refuse, since they would not be expected to contain ACM.
8. HEPA-vacuum/wet-wipe filter installation area and duct.
9. Install new filter and close unit.
10. HEPA-vacuum work area outside air-handling unit.
11. Reestablish air-conditioning unit operation.

Class IV Asbestos Work (cont.)

JPR IV-4: Emergency response action to an asbestos fiber release.

a. This job consists of the cleanup and/or decontamination of an area that has been subjected to an incidental minor or major fiber release of either a known ACM or a material that is reasonably expected to contain more than 1% asbestos. Immediate control measures can prevent further contamination of surrounding areas or adjoining facilities.

b. Responding FSS Environmental Support and OHD personnel will determine control measures to be established. OHD will determine the need to perform clearance air sampling.

c. FSS contractor personnel responding to a fiber release will not proceed with the cleanup until they ensure that OHD has been notified.

d. The competent person for the cleanup will determine whether the cleanup will be conducted under Class I, II, III, or IV asbestos work procedures.

e. If spills are small and FSS contractor personnel establish the regulated area, the FSS personnel will disestablish the area after final cleanup and inspection and will be responsible for removing barrier tape/warning signs. If OHD establishes the regulated area or decides that clearance air sampling is required, OHD will disestablish the area after final cleanup and inspection and will be responsible for removing barrier tape/ warning signs.

f. Communication with all parties in the affected area is very important. Therefore, the organization responsible for establishing the regulated area will ensure that the facility manager and work area supervisor have been informed about the response activity, the cleanup process and clearance air sampling to be performed (if required), and the approximate duration of the cleanup. This notification may be verbal but must occur before the start of the cleanup. The facility manager and work area supervisor should be asked to inform the occupants of the affected area. Additionally, occupants/employees in nearby areas should be informed about the cleanup activity and the expected duration.

g. The organization responsible for establishing the regulated area and removing the barrier tape and warning signs will provide courtesy notification to the EOC Security Dispatcher at nonemergency x34658 at the start and completion of the cleanup. Additional notification to JSC management will be made at the discretion of the responders.

h. The organization responsible for removing the barrier tape and warning signs will also be responsible for notifying the facility manager and work area supervisor that the area is clean and operations may return to normal. These notifications must be made in writing within 2 hours of the cleanup completion; e-mail notification is acceptable.

Emergency response cleanup requires a number of sequential and concurrent steps. The most prominent of these are listed below. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Class IV Asbestos Work (cont.)

1. Ensure supervision by a properly qualified, competent person.
2. Evacuate personnel and establish regulated area.
3. Notify FSS Environmental Support Contractor and OHD (SD3229) of the contamination. Provide courtesy notification to EOC Security Dispatcher at nonemergency x34658.
4. Responding FSS Environmental Support and OHD personnel will determine control measures to be established and will establish the requirements for OHD clearance air sampling.
5. The FSS competent person will determine whether the cleanup will be conducted as OSHA Class I, II, III, or IV asbestos-related work.
6. The assigned competent person shall verify that training, medical, and PPE requirements of the asbestos workers are complete and current.
7. Establish the regulated area. Place barricades and signs around the area.
8. Build small or large enclosure as needed/as appropriate; seal all entrances and exits with 6-mil polyethylene, construct airlock or "Z-flap" entrance, and install negative pressure on containment, if needed.
9. Shut down and isolate HVAC system. Perform operation/energy control procedures as needed (see Chapter 8.2 of this handbook).
10. Secure electrical and fire alarm systems. Perform operation/energy control procedures as needed (see Chapter 8.2 of this handbook). If necessary, disable fire alarm system by coordinating with the Fire Protection Coordination Office.
11. Don protective equipment and clothing and respiratory protection.
12. Conduct personnel and area sampling as directed by the OHD.
13. Apply the appropriate JPR to abate or repair ACM fiber release source, as needed.
14. HEPA-vacuum and wet-wipe contaminated area(s) and contaminated furnishings.
15. Bag contaminated items that cannot be decontaminated.
16. Perform gross and final cleaning as appropriate (see procedures in Chapter 12.12).
17. Visually inspect and re-clean as required (see procedures in Chapter 12.12).
18. Contact OHD as required for clearance visual inspection. Re-clean as required.
19. Decontaminate personnel and equipment with HEPA vacuum, and package contaminated materials—i.e., suits, cartridges, rags, etc.—for disposal.
20. Prepare bagged ACM for disposal.
21. Remove bagged ACM from the area.
22. Contact OHD to conduct clearance air sampling, as required.

Class IV Asbestos Work (cont.)

23. FSS or OHD personnel will disestablish regulated area and remove barrier tape and warning signs, as agreed upon (see statements above).
24. COSS or OHD personnel, as agreed upon (see statements above), will provide written notification within 2 hours to the facility manager and the work area supervisor of task completion and return of area to normal operations. Provide courtesy notification to EOC security dispatcher that cleanup is complete.

Attachment 12H

Custodial Work

C-1: Custodial work in rooms/areas with exposed or encapsulated sprayed-applied asbestos insulation or acoustical decoration. Some administrative work areas, conference/meeting rooms, and building lobbies have exposed ACM materials. While this ACM is not normally expected to delaminate or cause airborne asbestos fibers, take precautions to ensure that custodial staff cleaning these areas are protected and do not cause any debris to become airborne. All of these areas are posted with notifications about the hazard. The custodial staff must follow the following steps/procedures:

1. Verify that asbestos awareness training requirements are complete and current.
2. Do not poke at, dust, or disturb the exposed SAI or acoustical material.
3. Use a properly maintained HEPA vacuum, with attachments, to clean floors and furniture. Do not, REPEAT DO NOT, use a regular vacuum in these areas.
4. For Building 2S, use a dedicated vacuum cleaner, change the vacuum bag using specified procedures, and dispose of the bag as asbestos contaminated waste.
5. If you spot any asbestos debris, actual or suspected, in these areas, have the facility manager contact the FSS Contractorand/or OHD for an inspection and cleanup.

C-2: Custodial work involving asbestos-containing flooring (sheeting or floor tiles). Some buildings at JSC have floor tile or sheeting that contains asbestos. While this material is normally non-friable, take care to avoid disturbing the surface of the material in a manner that would generate asbestos fibers and cause exposures to custodial staff. If you are custodial staff, follow the following steps/procedures:

1. Verify that asbestos awareness training requirements are complete.
2. Do not sand, abrade, or grind on floor material.
3. When stripping old wax off the floor, use a wetted stripping agent to prevent dry rubbing of the floor surface, and use a machine that rotates with a speed of less than 300 rpm. (Reference OSHA 29 CFR 1910.1001(j) and 1910.1001(k))
4. Ensure there is a heavy coat of wax on the floor before polishing with a polishing machine. When polishing the flooring with a polishing machine, spray the floor with a water mist to prevent dry rubbing of the floor surface. It is desirable to use a machine that turns with a speed of less than 300 rpm.
5. If you spot any asbestos debris, actual or suspected, in these areas, have the facility manager contact the FSS Contractor and/or the OHD for an inspection and cleanup.

Attachment 12J

Asbestos Glossary

The following terms and definitions apply to Part 12.

Abatement – Procedures to control fiber release from any materials containing more than 1% asbestos such as surfacing materials, thermal insulating materials, and building and miscellaneous materials (roofing, siding, flooring, ceiling tiles, etc). It includes encapsulation, permanent enclosure, or removal of ACM during renovations and demolitions of facilities containing ACM.

ACM – Asbestos-containing material. Any material containing more than 1% asbestos by weight.

ACBM – Asbestos-containing building material. ACBM is surfacing ACM, TSI ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a building. A term used by the EPA. (40 CFR 763)

ACGIH – American Conference of Governmental Industrial Hygienists.

AIHA – American Industrial Hygiene Association.

AIHA – Accredited Laboratory. A certification given by the AIHA to an analytical laboratory that has been examined for quality control and proficiency and meets AIHA standards of performance and operation.

Airborne – Pertaining to materials that have been dispersed and are suspended or slowly falling in the air.

Airlock – An opening through an installed barrier system, usually consisting of two polyethylene curtained doorways at least 3 ft apart, at an asbestos abatement activity that allows ingress and egress of workers and materials and restricts the movement of airborne material from the contaminated area to the clean area.

Air Sampling/Air Monitoring – The process of measuring the fiber content/concentration of a specific volume of air in a stated time.

Amended Water – Water to which a chemical wetting agent (surfactant) has been added to improve penetration into asbestos-containing material.

APM – Asbestos Program Manager. The individual responsible for managing all aspects of the Asbestos Control Program. At JSC this individual is the Environmental Officer (JE).

Approved Respirator – Respiratory protection equipment tested and listed as satisfactory according to standards established by either NIOSH or the Mine Safety and Health Administration to provide respiratory protection.

Asbestos – The generic name for a variety of naturally occurring hydrated mineral silicates that possess a unique crystalline structure, are incombustible in air, and are separable into fibers. Six

Asbestos Glossary (cont.)

asbestos species were used commercially in large amounts: chrysotile, amosite, crocidolite, anthophyllite, tremolite, and actinolite. For purposes of Part 12, "asbestos" includes PACM, as defined below.

Asbestos-Containing Materials (ACM) – A material containing more than 1% of any type or mixture of types of asbestos.

Asbestos-Containing Building Material (ACBM) – ACBM is surfacing ACM, TSI ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a building. A term used by the EPA. (40 CFR 763)

Asbestos Fibers – Fibers longer than 5 microns (length-to-width ratio of 3:1) generated from an ACM.

Asbestos Program Manager – The individual responsible for managing all aspects of the Asbestos Control Program. At JSC this individual is the Environmental Officer (JE).

Asbestos Removal – The physical removal of ACM or PACM from an area.

Asbestos Worker – A JSC civil servant or resident support contractor employee who is routinely engaged in asbestos-related activities.

ANSI – American National Standards Institute.

ASTM – American Society for Testing and Standards.

Barrier – Any surface, warning tape, or sign that separates the asbestos-regulated area to inhibit the movement of fibers or unauthorized personnel.

Browncoat – A layer of plaster-like material, usually brown, covering the plaster ceiling to which the ACM coating is applied.

Certified Industrial Hygienist – A person having a college or university degree in industrial hygiene, chemistry, engineering, physics, or medicine or related biological sciences who, by virtue of special studies or training, has acquired competence in the practice of industrial hygiene ***and*** who has successfully completed examinations administered by the American Board of Industrial Hygiene, which certifies individuals in either the Comprehensive Practice of Industrial Hygiene or in an Industrial Hygiene Aspect (e.g.; chemistry, indoor environmental quality, etc.).

CFR – Code of Federal Regulations.

Class I Asbestos Work – Activities involving the removal of TSI, surfacing ACM, and presumed ACM (PACM). (29 CFR 1926.1101)

Class II Asbestos Work – Activities involving the removal of ACM that is not TSI or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor

tile and sheeting, asbestos concrete or asbestos cement items, transite, roofing and siding shingles, and construction mastics. (29 CFR 1926.1101)

Class III Asbestos Work – Means repair and maintenance operations where ACM, including TSI and surfacing ACM and PACM, is likely to be disturbed. (29 CFR 1926.1101)

Class IV Asbestos Work – Maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities involving the cleanup of dust, waste, and debris from Class I, II, and III activities. (29 CFR 1926.1101)

Clean Area – See Clean Room.

Clean Change Room – See Clean Room.

Clean Room – A clean room is an uncontaminated room/area having facilities for the storage of asbestos workers' street clothing and uncontaminated materials and equipment. The clean room must be equipped with a locker or appropriate storage container for each employee's use. Following showering, employees change into street clothing in the clean room area.

Clearance – Before release of an area upon completion of asbestos-related activities, visual inspections and/or clearance air sampling will be performed to ensure that no residual asbestos debris or airborne asbestos fibers remain.

Clearance Air Sampling/Air Monitoring – Air sampling, performed to verify that the airborne fiber concentration is less than 0.01 f/cc, done before releasing a regulated asbestos removal area.

Competent Person – A person who meets the requirements in Chapter 12.7 of this handbook and is designated as such by the employer.

Controlled Area – A term used within Part 12 to define an area that is not considered a regulated area under OSHA, but is subject to certain control procedures prescribed within Part 12 to minimize the potential asbestos exposure of employees, workers, and building occupants.

Custom Containment Bag – See Glovebag.

Decontamination – The process of removing contaminates that have accumulated on personnel and equipment to prevent exposure of the people or contamination of otherwise uncontaminated people, areas, or equipment.

Decontamination Area – A decontamination area is an enclosed area adjacent and connected to the regulated area consisting of an equipment room, a shower area, and a clean room, used to decontaminate workers, materials, and equipment that are contaminated with asbestos. The enclosure for this area is typically constructed of plastic, with curtained doorways between adjacent rooms; however, it may be a portable, prefabricated unit.

Asbestos Glossary (cont.)

Demolition – The wrecking or removing of any component, system, finish, or assembly of a facility together with any related handling operations.

Disturb/Disturbance – An activity that disrupts the matrix of ACM or PACM, crumbles or pulverizes ACM or PACM, or generates visible debris from ACM or PACM. A disturbance includes cutting away small amounts of ACM and PACM no greater than the amount that can be contained in one standard-sized glovebag or waste bag to access a building component. (29 CFR 1926.1101)

Employee – A JSC civil servant or a support contractor.

Encapsulant – A liquid material that can be applied to ACM that controls the possible release of asbestos fibers from the material either by creating a membrane over the surface (a bridging encapsulant) or by penetrating the material and binding its components together (a penetrating encapsulant).

Encapsulation – The treatment of ACM with a material that surrounds or embeds asbestos fibers in an adhesive matrix to prevent the release of fibers; a bridging encapsulant or a penetrating encapsulant.

Enclosure (1) – As used in Part 12 and by OSHA, means the construction of an airtight, impermeable, temporary barrier around a regulated area to control the release of asbestos fibers into the air where they could migrate into an adjacent area.

Enclosure (2) – As used by the EPA for response actions, means the construction of an airtight, impermeable, permanent barrier around ACM and ACBM to control the release of asbestos fibers into the air.

Environmental Office (JE) – The office at JSC that is responsible for ensuring compliance with federal, state, and local environmental regulations.

Equipment Room – A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

EPA – Environmental Protection Agency.

f/cc – the concentration of airborne fibers expressed as the total number of fibers per cubic centimeter of air.

Fiber Count – A total number of fibers, of specified diameter and length, obtained by microscopic examination of a filter through which air has been drawn.

Fit Test – A test that usually exposes a person wearing a respiratory protection device to a gaseous or aerosol test mixture in a test environment to determine the fit or integrity of the facepiece-to-face seal of the respirator. The test may be qualitative, where the person tested

determines by smell or taste whether the mask is leaking, or it may be quantitative, where the concentration of the test mixture inside and outside the mask is determined by instrumentation.

Friable – A material that crumbles, pulverizes, or reduces to powder from hand pressure.

Glovebag – A sack, typically constructed of 6-mil transparent polyethylene or polyvinyl chloride plastic, with two inward-projecting long sleeve gloves, that is designed to enclose an object from which an ACM is to be removed.

Grade D Air – Breathing air that contains 19.5 to 23% oxygen, no more than 5 micrograms per cubic meter of condensed hydrocarbons, no more than 20 ppm of carbon monoxide, no pronounced odor, and a maximum of 1000 ppm carbon dioxide. The Compressed Gas Association, Specification G-7, is the consensus standard for Grade D breathing air criteria.

HEPA Filter – A filter that is capable of trapping and retaining 99.97% of particulates greater than 0.3 micron in size.

HEPA Filtered Vacuum – A vacuum cleaner with an HEPA filter that is capable of trapping and retaining 99.97% of all particulates larger than 0.3 microns.

Holding Area - Airlock between the shower room and the clean room in a worker decontamination system.

HVAC – Heating, ventilation, and air conditioning; generally denoting the air-handling unit and ductwork system found in buildings.

Hygiene Facility – The incorporation into an asbestos-removal enclosure of clean rooms, equipment rooms, shower rooms, and decontamination rooms.

Lagging – Strips of insulating materials with which boilers, cylinders, or pipes are covered. Sometimes it also refers to insulating mud and final overlays (cloth or metal).

Large Enclosure – An enclosure providing an airtight, impermeable barrier around a job involving the removal of more than 260 lf, 160 ft^2, or 35 ft^3 of ACM. Large enclosures will most likely incorporate airlocks, negative air-filtering systems, hygiene facilities, contaminated equipment rooms, and waste load out rooms.

LO/TO – Lockout/tagout.

Lockout/Tagout – The process of ensuring that an item of equipment is secured, isolated, or shut down and to prevent its being energized. If such equipment were energized, it would present a safety hazard to workers. Each worker affected by the equipment will place his/her own lock and tag on the equipment when entering an area affected by, or when starting maintenance on, the equipment. Building systems most often affected by LO/TO procedures at JSC are water distribution, electrical, HVAC, and fire alarm systems.

Asbestos Glossary (cont.)

Major Fiber Release – The falling or dislodging of more than 3 ft^2 or 3 lf of friable ACM/ACBM. (40 CFR 763.91(f))

Medical Examination – An evaluation of a person's health status conducted by a medical doctor.

Medical History – A person's past health record, including all of the hazardous materials to which he or she has been exposed and any injuries or illnesses that might dictate future health status or work abilities.

Method 7400 – This is an NIOSH sampling and analytical method for evaluating airborne fiber concentrations using phase-contrast microscopy.

Method 7402 – This is an NIOSH sampling and analytical method for evaluating airborne fiber concentrations using transmission electron microscopy. Asbestos fibers are counted using the same fiber definitions as Method 7400.

Micron – A measurement of length equal to one millionth of a meter.

Mine Safety and Health Administration – The counterpart of OSHA for the mining industry.

Minor Fiber Release – The falling or dislodging of 3 ft^2 or 3 lf or less of friable ACM/ACBM. (40 CFR 763.91(f)).

NESHAP – National Emission Standards for Hazardous Air Pollutants under the Clean Air Act, EPA Regulation 40 CFR Part 61, as amended. The standard for asbestos emissions is found at 40 CFR 61, Subpart M, National Emission Standard for Asbestos, Sections 140-157 (40 CFR 61.140-157).

NIOSH – National Institute for Occupational Safety and Health, a division of the Centers for Disease Control and Prevention, U.S. Public Health Service, Department of Health and Human Services.

Negative Air Filtration Unit – A piece of equipment consisting of an air mover, usually electrically powered, and an HEPA filter. The unit maintains a negative pressure inside the regulated work area, a constant airflow from adjacent areas into the regulated work area, and exhausts that air to the outside.

Negative Pressure Respirator – A respirator in which the air pressure inside the respirator-inlet covering is positive during exhalation (in relation to the air pressure of the outside atmosphere) and negative during inhalation (in relation to the air pressure of the outside air).

Negative Pressure System – A local exhaust system that is capable of maintaining a constant, low-velocity air flow into the decontamination enclosure systems and work area from adjacent unsealed areas.

Asbestos Glossary (cont.)

OSHA – The Occupational Safety and Health Administration, a division of the U.S. Department of Labor established by the Occupational Safety and Health Act (OSH Act) of 1970. Regulations promulgated by OSHA govern occupational safety and health issues affecting the working population in the general industry, the construction industry, and other industrial classifications.

PACM – Presumed asbestos-containing material. PACM most often is TSI and surfacing material found in buildings constructed no later than 1980.

PAT Program – Proficiency Analytical Testing Program, conducted by the AIHA. A program that, through the submission of unknown standardized samples (including asbestos samples) to analytical laboratories, determines the proficiency of the laboratory in conducting analytical tests.

PEL – Permissible exposure limit, as established by OSHA. The PEL for asbestos exposures is 0.1 f/cc, expressed as an 8-hour TWA concentration, as stated in 29 CFR 1910.1000 and 29 CFR 1926.1101.

Permissible Exposure Limit – As established by OSHA. The PEL for asbestos exposures is 0.1 f/cc, expressed as an 8-hour TWA concentration, as stated in 29 CFR 1910.1000 and 29 CFR 1926.1101.

Personal Air Sampling/Air Monitoring – The sampling of the asbestos fiber concentration within the breathing zone of a worker in an asbestos work area.

Personal Protective Equipment – PPE.

Phase Contrast Microscopy – A technique that uses a light microscope adapted with phase contrast optical elements to provide enhanced contrast between the fibers and the background, to count fibers on filters through which a volume of air has been pulled. The technique does not distinguish fiber types. This is the standard technique recognized by OSHA.

PPE – Personal protective equipment.

Presumed Asbestos-Containing Material (PACM) – Material presumed to be ACM. PACM most often is TSI and surfacing material found in buildings constructed no later than 1980.

Protection Factor – The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator at the breathing zone of the wearer. The protection factor is a measure of protection provided by a respirator to the wearer.

Plenum – An air compartment connected to one or more ducts as part of an air distribution system. In many buildings, the space between the building structure and a false ceiling is used as a return air plenum in the building HVAC system.

RFCI – Resilient Floor Covering Institute (see below).

Asbestos Glossary (cont.)

Regulated Area – An established area that identifies where airborne concentrations of asbestos fibers exceed, or may be expected to exceed, the PEL. Specific controls are required by OSHA regulation in conducting activities in these areas.

Removal – Taking out or stripping substantially all ACM/ACBM from a damaged area, a functional space, or a homogeneous area in a building. (40 CFR 763)

Repair – Returning damaged ACM/ACBM to an undamaged condition or intact state so as to prevent fiber release. (40 CFR 763)

Resilient Floor Covering Institute (RFCI) – OSHA has accepted that certain RFCI procedures for removing floor coverings will not cause exposures above the OSHA PEL. For a copy of these procedures, see the RFCI Web site at http://www.rfci.com/index.php . See the TDSHS statement concerning RFCI procedures at http://www.dshs.state.tx.us/asbestos/pdf/ARC022.pdf .

Respirator – A respiratory protection device consisting of a facepiece connected either to an air source or to an air-purifying device.

Response Action – A term from EPA that means a method, including removal, encapsulation, permanent enclosure, repair, operations and maintenance, that protects human health and the environment from friable ACBM. (40 CFR 763).

SAI – Spray-applied insulation, insulating materials containing one or more types of asbestos sprayed on, generally to the interior surfaces of buildings.

Scanning Electron Microscopy – A method of microscopic analysis that uses an electron beam directed at a sample and then collects the beams that are reflected to produce an image from which fibers can be identified and counted.

Self-Contained Breathing Apparatus – A respiratory protection device usually consisting of a facepiece connected by a hose and a regulator to an air source (compressed air, compressed oxygen, or an oxygen-generating chemical) carried by the wearer.

Sealant – A chemical agent applied to ACM to fix the material and reduce the potential for fiber release into the ambient environment (see encapsulant).

Small Enclosure – An enclosure providing a control around a job larger than what a glovebag will accommodate, or that is needed to provide more protection than a barrier system. The small enclosure is generally limited in size and used for small-scale, short-duration activities. A small enclosure may not involve the use of negative-pressure systems, but will have an entrance chamber or multiple entry flaps. Small enclosures rely on HEPA-filtered vacuums and wet methods to control fiber concentrations.

Asbestos Glossary (cont.)

Surfacing Material – Includes material that is sprayed, troweled on, or otherwise applied to surfaces of ceilings, structural members, and other surfaces for fireproofing, acoustical, and other purposes.

Surfactant – A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.

TCEQ – Texas Commission on Environmental Quality. The TCEQ has established requirements for the disposal of asbestos waste.

TDSHS – Texas Department of State Health Services (see below).

TLV – Threshold limit value; an airborne exposure guideline developed by the ACGIH (see below).

TNRCC – Texas Natural Resource Conservation Commission. The TNRCC was renamed the TCEQ on September 1, 2002.

TWA – Time weighted average (see below).

Threshold Limit Value (TLV) – An exposure guideline developed by the by the ACGIH to assist in the control of health hazards. The TLV refers to airborne concentrations of substances and represents conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. The ACGIH TLV for asbestos is 0.1 f/cc, expressed as an 8-hour TWA concentration.

Texas Department of State Health Services (TDSHS) - The TDSHS mission is to protect and promote the physical and environmental health of the people of Texas from asbestos.

The TDSHS Asbestos Programs Branch has two programs to meet these concerns. The Licensing Program issues licenses to persons qualified for asbestos-related work in public buildings. The Enforcement Program has regional inspectors available to monitor asbestos removal in buildings, and to respond to community concerns to ensure that public exposure is minimized. The TDSHS has established rules and regulations for asbestos in the Texas Administrative Code, Title 25, Health Services, Part I, Texas Department of Health, Chapter 295, Occupational Health (25 TAC 295). These regulations and other information can be found at the TDSHS Web site for asbestos programs URL: http://www.TDSHS.state.tx.us/beh/asbestos/.

The TDSHS has also been designated as the Texas regulatory agency to ensure compliance with the Clean Air Act, NESHAP, and associated EPA standards and regulations. Asbestos emissions from abatement activities and building demolitions are regulated under NESHAP.

Time Weighted Average (TWA) – The average concentration of a contaminant in air during a specific time interval.

Asbestos Glossary (cont.)

Transmission Electron Microscopy – A method of microscopic analysis that focuses an electron beam onto a thin sample. As the beam penetrates (transmits) through the sample, the difference in densities produces an image on a fluorescent screen from which asbestos fibers can be identified and counted.

Wet Cleaning – The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, and other cleaning tools that have been dampened with amended water and of disposing of these cleaning tools as asbestos-contaminated waste.

Work Area – The room or space where asbestos-related work or removal operations are performed that is defined and/or isolated to prevent the spread of asbestos dust, fibers, or debris and to prevent entry by unauthorized personnel (see regulated area).

Worker – A person engaged in the abatement of asbestos or performing a task in which asbestos exposure is likely. Distinguished from an asbestos worker, who is routinely exposed to asbestos fiber concentration levels in excess of the action level of 0.1 f/cc on an 8-hour TWA.